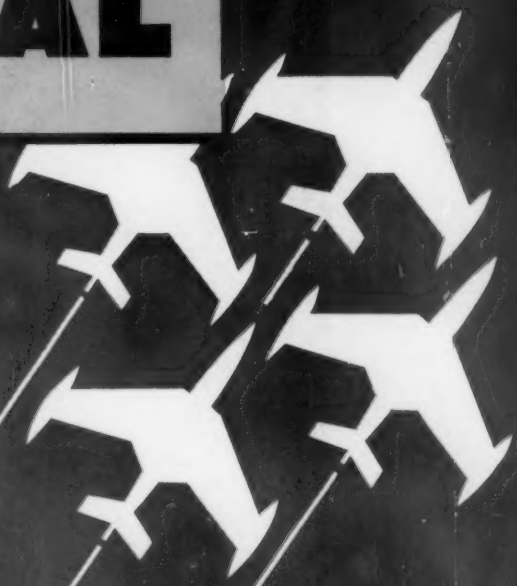
the OIL AND GAS JOURNAL

PUBLISHED WEEKLY

NOV 2 1959



U.S. MILITARY FUEL DEMAND DROPS

Here's how the Defense Department sees the oil picture for next 5 years ..... p. 52

IPAA expects 3.4% rise in domestic demand p. 46

New afterburner may beat smog problem p. 48

Central control means improved power flow p. 70

Automatic program cuts computer operating costs p. 80

ONE DOLLAR PER COPY

Four vessels fabricated in Wyatt's Houston plant for Phenol extraction service

1 2 3 4

PROCESSING FOURSOME

Wyatt's
HOUSTON - DALLAS
CORPUS CHRISTI - MEXICO CITY

MANUFACTURERS AND ERECTORS SINCE 1913

WYATT METAL & BOILER WORKS, INC.

MANUFACTURING PLANTS
Houston • Dallas • Corpus Christi • Mexico City

SALES OFFICES
Houston • Dallas • Corpus Christi • Tulsa • New York
Philadelphia • Pittsburgh • Los Angeles • Mexico City

SUBSIDIARY
Wyatt's Plastics, Inc.
Houston and Wallis

AFFILIATE
Wyatt de Mexico S.A. de C.V.
Mexico 1, D.F.

OIL AND GAS JOURNAL
Vol. 57 No. 45

Contents November 2, 1959

THE WEEK'S NEWS

General Interest:
IPAA Forecasts 3.4% Increase in Domestic Demand ... 46
Alvin Hope Elected President of IPAA at Dallas Meeting ... 47
New Afterburner May Be Big Step Toward Smog Control ... 48
It's Doubtful Canada Can Reach Borden Commission Goals ... 50
Stueck Says Workable Gas Controls Hinge on Cooperation ... 59
FPC Natural-Gas Decisions Are Ending Up in Court ... 62
Phillips Executive Predicts Continued Boom for LPG ... 62
Free-World Crude Production Continues in Slump ... 65
Photos in the NEWS ... 68

Pipelining:
Mobil Pipelines Will Be Taken Over by Magnolia Pipe Line ... 49
Pipeline Briefs ... 54
Alberta Foothills Gas Line Gets Go-Ahead Sign ... 56

Processing:
Processing Briefs ... 50
Military Fuel Demand to Drop, Then Bounce Back Up ... 52
Integrated Research Is Object of New Union Carbide Center ... 58
Esso Research Opening New Florham Park Center ... 60

Foreign News:
A Top Oil Economist Takes a Look at Trinidad ... 63
First Section of Persian Gulf Pipeline Completed ... 66
Conorada Obtains Concession in Australia ... 66
Karsal Field Promises to Hike West Pakistan Production ... 67

Exploration:
Texas Has First Offshore Discovery of the Year ... 54
Arkansas Quadruple Completion Spotlights Gas Potential ... 123
Subsurface Look at Amarillo-Hugoton Area: Part II ... 124
Exploration Outlook: Texans Look Southwest ... 127
Oil Search Moves into Kentucky Coal Country ... 130

NEXT WEEK

A 16-page special report entitled "Oil Gets Set for the 60's" will be featured in next week's Journal. The report, which will cover all phases of the industry, is based on interviews with some of the industry's top men. Their thinking will be reflected in this report on oil's outlook for the 60's.

EVERY WEEK

Advertisers' Index ... 151
Book Review ... 82
Calendar of Events ... 36
Classified Advertising ... 147
Deaths ... 140
Drilling Contractors ... 121
Drilling Statistics ... 143
Editorial ... 45
Equipment Men ... 115
Exploration Highlights ... 123
Foreign News ... 63
Journally Speaking ... 41
Markets ... 146
New Equipment ... 104
On the job Pipelining ... 99
Personals ... 138
Production ... 144
Questions on Technology ... 78
Refinery Cost Index ... 77
Refinery Oper. Index ... 77
Statistical Summary ... 142
They Say ... 30
Trade Literature ... 110
Watching Washington ... 61

Technology-Operation section on next page →

The Oil and Gas Journal is published weekly with an additional issue in January by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa 3, Okla. Second-Class postage paid at Tulsa, Okla. Copyright 1959 by The Petroleum Publishing Co. United States and foreign rates to the petroleum industry, 1 year $5, 2 years $8, 3 years $10.

Annual index available on request.

TECHNOLOGY—OPERATION

Production

Computer Application to a Gas-Storage Aquifer 72

By David Cornell

The use of gas-storage aquifers for supplying natural gas during periods of peak requirements is of increasing importance. It is expected that many such fields may be put into operation during the coming years. Knowledge of the performance of such storage reservoirs is essential to their proper design and operation.

Drilling

New Mud Features Low Filtrate Loss, Good Rheology Retention .. 83

By Jack C. Cowan

These are practical features at high temperatures since the mud has been proved at 450° F. The lignite-sodium-surfactant mud is not a highly complex fluid and is no more difficult to maintain and control than are conventional muds.

New Hammer Drill Speeds Air Drilling 88

By Walter E. Liljestrand

The long program of laboratory and field testing has resulted in the production of this new tool which can be operated by air or gas. Where air drilling is now economical, it will cut well costs even further because it increases drilling rate two to three times and prolongs bit footage as much as four times.

Refining-Processing

Central Electrical Control System Means Better Operation 70

Reduced upkeep, better operation, and faster restoration of power after an outage mark the operation of the new electrical control system at Esso Standard's Baton Rouge refinery.

Nelson Refinery Cost Indexes 77

Refinery construction and refinery operating cost indexes.

Questions on Technology 78

Waxy crudes are scarce. Gas-compressor-station costs brought up to date. Labor cost of vessels.

Automatic Programing Can Cut Computer Operating Costs 80

By Thomas S. Grier

Continuing work on the part of many groups is helping to overcome many of the limitations associated with computer usage and is bringing about a more effective and complete use of computer capabilities. Work is accelerated by letting the computer itself do much of the costly and time-consuming labor needed to prepare a problem for the computer.

Pipelining

New Terminal for Lake Maracaibo 92

Important crude-handling and transportation economies will result from Shell Venezuela's large terminal storage capacity and tanker-loading facilities at Puerto Miranda. Shell will be able to export practically all of its products in the new and large ocean tankers.

Argon-41 as Gas-Flow Tracer 99

By R. T. Ellington, W. R. Staats, and D. V. Kniebes

This material is turning out to be a very satisfactory tracer for use in natural-gas work. With future improvement this method should be usable for spot checking of orifice meters and permit more accurate results from use of ammonia tracer.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Nov. 2, 1959

Demand will increase in 1960 but at a slower rate:

The IPAA's supply-demand committee forecasts these trends for the new year:

...Total demand at record average 10,045,000 bbl. day, up 3.3% from revised 1959 estimate of 9,727,000 bbl. The 1959 figure is 4.1% higher than actual 1958 volume.

...Domestic demand for 1960 will average 9,802,000 bbl. daily, a 3.4% jump.

...Domestic production of crude and natural gas liquids will average 8,439,000 bbl. daily, up 6.8%.

For the fourth quarter, IPAA forecasters see a demand for products of 10,242,000 bbl. daily, up sharply from the third quarter. This demand is expected to work off 618,000 bbl. daily of present surplus stocks (p. 46).

▼ ▼ ▼

Bright prospects of a continued market growth in LPG of about 5% annually is predicted for southern meeting of Natural Gasoline Association of America.

Areas of growth include domestic heating, motor fuels, petrochemicals.

Supply outlook also is good except for butanes. They may prove short because of heavy demand by refiners to use in isomerization and alkylation facilities (p. 62).

▼ ▼ ▼

It's a good time to sell oil properties, according to brokers and property appraisers.

Reason: Buyers far outnumber the sellers. Interest in acquiring producing oil property is keen not only by legitimate oil companies but also by petrochemical firms, other businesses, and people with surplus money to invest.

Buyers are facing two big hurdles currently: Sellers almost invariably want far too much for their properties. Financing is tough and the 5½-5¼% interest rates stretch the pay out.

▼ ▼ ▼

Oil men may soon learn they've been drilling holes much straighter than is actually needed.

Wells, naturally, have to be straight enough to keep on the lease. But they need not be anywhere near vertical in order for all drilling and production tools to work perfectly.

Real causes of trouble are extremely sharp changes in hole angle—dog legs. A team of scientists has been studying this problem along with others in straight-hole drilling and expect to make a report soon.

On basis of preliminary study, however, one big operator has relaxed its hole-angle requirements in drilling contracts in many areas. In at least one case, it meant cutting drilling time from almost 4 weeks to nearly 1 week.

Standard well-servicing or workover contract is being drafted by AAODC.

A first draft may be ready within a month. It will be sent around for suggestions from all sides.

What chance of acceptance the idea has is a question. AAODC is still trying valiantly to get acceptance of its standard drilling contract form. Most operators, particularly the majors, prefer to use their own.

Success has marked water shutoff treatments using the silicon tetraflouride in air-drilled holes.

One treatment still had water shut off completely after about 3 weeks of subsequent air drilling. There have been serious questions about how long the treatments would last even if they were initially successful. The treatments have been successful in about 75% of the times.

Drilling notes: Expect operators more and more to combine air drilling and slim-hole drilling in double attack on well costs. Also look for air drilling to be stepped up in the deeper holes...New oil-well cement has been developed by a Canadian engineer. It is expected to answer many tough well-completion problems because it expands as it sets up, is completely impermeable, and has high early strength.

▼ ▼ ▼

A new scouting service, Williams & Lee, is writing contracts with 17 oil companies in West Texas and 16 in eastern New Mexico.

Charge for West Texas well data is $950 monthly per subscriber and $500 monthly for the eastern New Mexico report.

Significant discoveries:

Pure Oil apparently has major gas-condensate well at its Northwest Lisbon wildcat in Paradox basin. Its 14,000 M.c.f. gas flow from the Mississipian will increase drilling interest in north and northeast sides of the basin.

Texas National Petroleum's Mesaverde Almond discovery is an oiler in the gas-producing West Desert Springs area of Green River basin, Wyoming.

New pay—the Fort Union Tertiary—has been picked up by the State Line Unit astride the Colorado-Wyoming line. Well made 6,000 M.c.f. in expanding the Gulf Oil gas area.

Two strikes in Redwillow County, Nebraska, push this northwest Kansas-southern Nebraska play east. Frontier Refining has Pennsylvanian prospect 10 miles northeast of production at Poore field. Aladdin Petroleum has another one 5½ miles southwest.

Good gas shows in the Cotton Valley formation have been recorded in Caraway-Pan American 1 McCoy in Van Zandt County, Texas. Operator is drilling deeper to Smackover. But if completion is made in the Cotton Valley, it will be a first for the 200-mile long Luling-Mexia-Talco fault trend.

▼ ▼ ▼

Suppliers of gas to Transwestern have two FPC dates.

They'll present new exhibits to FPC on January 4 in an attempt to justify field prices. Producers' wellhead prices were cut 1 to 6 cents in FPC's August order conditionally approving the Texas-California gas line.

Producers will be cross examined on February 16 after which FPC will rule on their appeal.

Seven construction spreads, meanwhile, are getting started on the $191-million project which is due for completion next June. The price hearings have no effect on the Transwestern construction because producers already have accepted certificates.

Pacific Gas & Electric's proposed line from Alberta to San Francisco will pass near many communities not yet served by Pacific Northwest Pipeline in its marketing area.

But PG&E disclaims interest in any but its own market in California.

Pacific Gas Transmission, which will build the Idaho-Washington-Oregon section of the proposed Alberta-San Francisco line, will have several owners. Pacific Gas & Electric will hold 50% interest, Canadian Bechtel 9%, Bright & Co. 7%, International Utilities Corp. 7%, Montana Power 2%, and the public 25%.

Alberta Government has given Alberta Gas Trunk Line final approval on a $103 million foothills gas pipeline system.

Its 663,000 M.c.f. top daily capacity will be used to deliver gas to Westcoast Transmission and Alberta Southern Gas for export to the U. S. (p.56).

FPC member Frederick Stueck apparently feels the problem of fast rising field prices for natural gas which so alarmed consumers a few years ago has about run its course.

Gas prices are nearing their economic ceiling in some

areas, he says. They can't advance much more without losing markets to other fuels.

Stueck indicates the time is now right for developing new and much simpler approach to regulating producers' prices. Big possibility: Area price ceilings (p. 59).

▼ ▼ ▼

A new refinery may be built at Marseille in France by Jersey Standard.

The project reportedly is under study. Possibility of its being built was revealed recently at the inauguration of the 31,000-bbl. Bordeaux plant of the company's French affiliate, Esso Standard S. A.

Engineers and chemists for generations have worked the "bugs" out of process units. Now comes a switch:

Research is being done at Louisiana State into possibilities of using microbes to refine petroleum.

Dr. R. J. Strawinski, who devised a method of using microorganisms to locate oil deposits, now is investigating their potential for converting impurities found in oil.

World-wide capacity for petrochemical acetylene will top 250 million pounds at year's end.

Commercial installations now going up for converting hydrocarbons to this important petrochemical building block will represent several partial-combustion processes available to the industry.

Petrochemical acetylene probably will never replace the older carbide acetylene. It will continue to find favor in areas with adequate supplies of inexpensive hydrocarbons.

One bonus of the new processes: Off gases may be used in the synthesis of ammonia and other products.

Race for supertanker title continues despite depression in world hauling that has laid up 7,500,000 tons of shipping.

Keel was laid early last month at Bethlehem Steel's Quincy yards for 106,500-ton tanker for Stavros S. Niarchos. It will top the 104,520-ton Universe Apollo owned by National Bulk Carriers. But now National Bulk Carriers announces the keel has been laid at Kure, Japan, for 110,000-ton ship.

A different formula may be tried in handling requests for product import quotas from newcomers.

Under the proposed procedure, anyone wishing to obtain a quota would make application to the Oil Import Appeals Board. The board would consider each case individually, taking weight of several factors including location of company, its facilities, and its competitive position (See Watching Washington, (p. 61).

Good Wells Make Good News

A Monthly Report On Wells That Are Now Worth More

November 2, 1959

Many operators want to know just how jobs engineered with the aid of the "Frac Guide"* compare with others. It will be many months before the full story is available, but these four cases will give an idea.

- Pembina Area, Alberta, Canada (New Oil Well) This well was completed into the Cardium through perforations between 4187 and 4204 feet. Porosity was 13 per cent and permeability was 3.8 millidarcies. Using the "Frac Guide", Dowell recommended Sandfrac*. 25,000 gallons lease crude and 68,000 pounds sand were injected at 15 bpm. Result: Gas-oil ratio dropped. Production tested at 46 bopd flowing. Allowable is 33 bopd. Well has continued to flow with no drop in production, although offsetting wells fractured without the aid of the "Frac Guide" usually have to be put on the pump after producing about one month.

- Lea County, New Mexico (Old Oil Wells) Two offsetting wells were completed open hole into the Grayburg at about 4100 feet. Production had declined and operators decided to fracture both wells. One well was treated without the aid of the "Frac Guide". 15,000 gallons lease crude and 15,000 pounds sand were injected down casing. Production rose initially, but dropped to about 5 bopd after 120 days. Treatment for the other well was engineered with the "Frac Guide". 20,000 gallons refined oil and 50,000 pounds sand were injected down 3-inch tubing. Production rose to 90 bopd, flowing. After 120 days, it was still 45 bopd, flowing.

- Ashtabula County, Ohio (New Oil and Gas Well) This well, completed open hole into the Clinton sand (3135 to 3140 feet), made only a show of oil and gas before treatment. The "Frac Guide" was used to engineer a treatment with over twice the concentration of sand per gallon of fluid previously used in this area. 16,000 gallons fresh water with FLA* (Fluid Loss Additive) carried 32,000 pounds sand into the formation. Treatment was down 5½-inch casing at 34 bpm. After clean-up, well made 1000 mcfd and 25 bopd. It was the best well in the area.

- Beaver County, Oklahoma (New Gas Well) The lower Morrow sand was perforated from 7214 to 7245 feet. Well made only a show of gas after being cleaned up with 500 gallons Mud Acid. The "Frac Guide" indicated that Waterfrac should be used. 20,000 gallons gelled water and 59,000 pounds sand were pumped down 4½-inch casing at 39 bpm. After clean-up, well made 9900 mcfd on State test.

Take advantage of Dowell's experience with the "Frac Guide" to help you get more profit from your operations. For service or detailed information, contact the Dowell office or station nearest you. There are more than 165 locations in the United States, Canada, Venezuela and Argentina. Dowell, Tulsa 1, Oklahoma.

*Dowell Trademark

Services for the oil industry DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

Norris Suggests —

Keep Straight Rods Straight

...to Reduce Your Pumping Costs

Helpful Hints

- Packaged rods should be handled only with suitable equipment. Adequate grapple-lines prevent sagging and bending. Rods are packaged for protection and convenience, an advantage to be used, not abused.
- Rods should be transferred singly. Do not throw, flip or whip. Wherever possible they should be evenly supported end to end.
- Lay down rods in singles only (never doubles). Use proper skids or blocks.
- Do not walk on rod stack during loading or unloading.
- Do not drive over rods.

Norris gives you the right rod — give it the right care!

NORRIS QUALITY
SUCKER RODS
POLISHED RODS - COUPLINGS

W. C. NORRIS, MANUFACTURER
DIVISION OF DOVER CORPORATION
TULSA, OKLAHOMA

BRANCHES: Great Bend, Kansas; Corpus Christi, Houston, Kilgore, Odessa, Wichita Falls, Texas; Oklahoma City, Oklahoma; Salem, Illinois; Casper, Wyoming; Farmington, New Mexico; Edmonton, Alberta, Canada.

Buy From Your NORRIS Distributor

How to get a bigger share of the diesel market

Formulate superior diesel fuels using DuPont FOA-2 to reduce filter plugging

When you add Du Pont Fuel Oil Additive No. 2 to your lower grade stocks, you cut down the rate of sludge formation and greatly improve the fuel.

This is because FOA-2 is an excellent dispersant and solubilizer. It reduces the size of insoluble residue particles. The tiny particles can then flow through the system and burn with the oil. Consequently, filter-clogging and injector-sticking are greatly reduced.

Performance tests have demonstrated the effectiveness of FOA-2. For example, in one test with a heavy cycle stock treated with FOA-2, the engines ran for 35 days without changing filters and without appreciable pressure drop. Without FOA-2, the filters became blocked in one week.

FOA-2 not only cuts sludge formation, it often cleans parts where sludge has begun to build up.

Being ashless, FOA-2 does not contribute to exhaust stack sparking.

Because of its many outstanding advantages, Du Pont FOA-2 is now being widely and successfully used by many oil companies in the diesel fuels supplied to the nation's leading railroads.

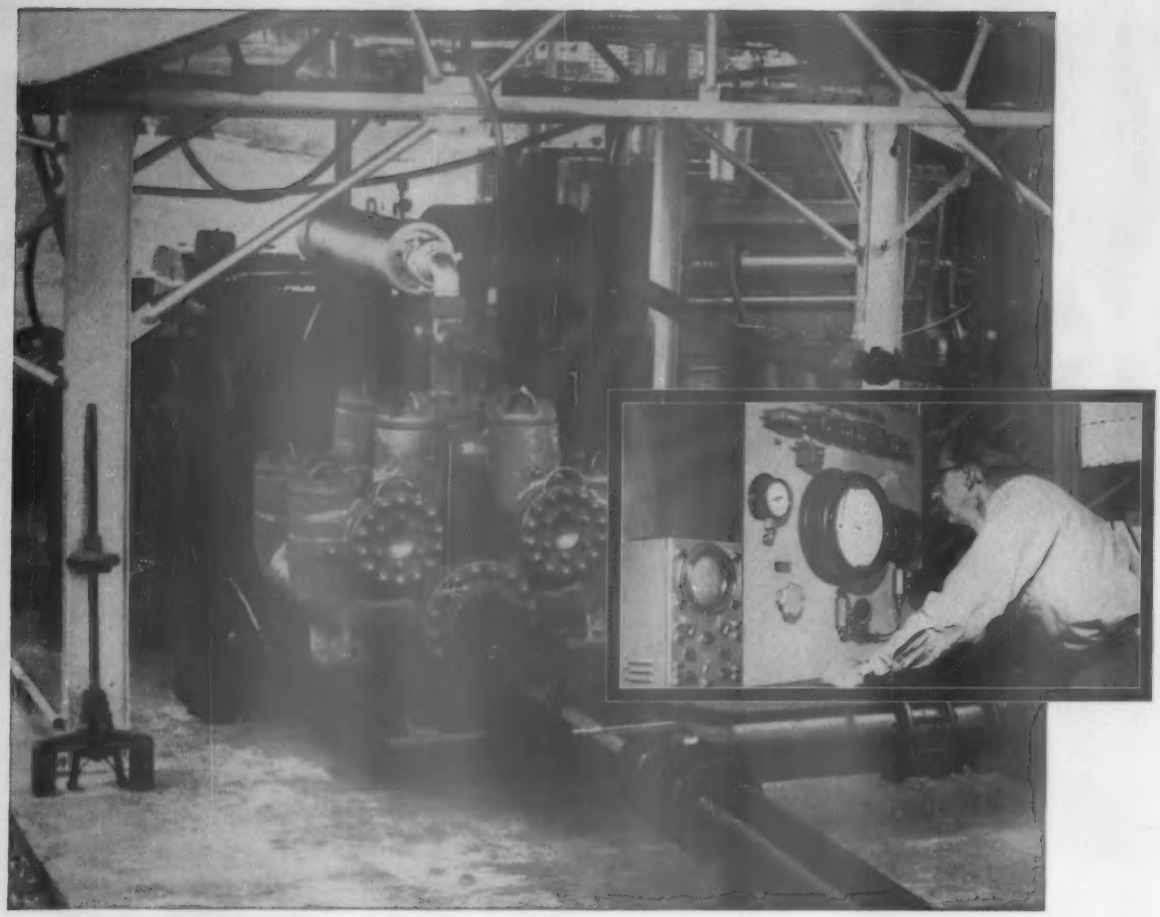
Your Du Pont representative can fill you in with further details. Or you can write for more information to E. I. du Pont de Nemours & Co. (Inc.), Petroleum Chemicals Division, Wilmington 98, Delaware.

Better filterability of FOA-2 treated fuel is shown here. The filter at the left was clogged in a week's use of untreated economy fuel. The clean filter at the right was used several weeks in an economy fuel with FOA-2 added.

DU PONT
REG. U.S. PAT. OFF.

Better Things for Better Living
. . . through Chemistry

Tetraethyl Lead
and other
Petroleum Additives



Torture Chamber for Fluid End Parts

Pictured above is a section of "Oilwell's" testing facilities at Garland, Texas. This big slush pump with 1,300 hp available provides the "Torture Chamber" devoted exclusively to wear-duration and destruction tests under simulated field conditions on all fluid end parts.

The things we learn in this testing laboratory are translated into real benefits for *you*. Here's how:

Benefit No. 1 Test results point the way to continuing product improvement . . . giving you more and more for your money with each development.

Benefit No. 2 As new designs and materials are proven, wear life of each part is increased . . . assuring substantial savings to you in replacement costs.

Take advantage of the practical design features and proven performance of the "Oilwell" parts listed on the right. They are today's best buy . . . and they'll prove it to you.

USS, "Oilwell", and Wilson-Snyder are registered trademarks

Get Extra Service with these "Oilwell" Products.

DI-HARD Liners give longer service but cost no more.

HI-HARD Piston Rods have hard surface on tough high tensile core.

HI-HARD Chrome Piston Rods have a heavy coat of chrome to resist corrosion.

"4-on-1" Wilson-Snyder Pistons have the never-wear-out body.

Valves and Seats have more metal-to-metal contact plus greater fluid flow.

Rod Packing, Liner Packing and Gaskets are made to rigid specifications.

USS **Oil Well Supply Division of United States Steel**

Executive Offices—Dallas, Texas
Export Office—30 Rockefeller Plaza, New York 20, N.Y.

Duriron®

impressed current Anodes

for cathodic protection of a pipe line were jetted into position in 60 seconds!

4-year-old installation WITHOUT BACKFILL provides positive protection

Creek bed . . sandy soil . . pipe line . . difficult protection problem, but not for Duriron Anodes! As shown in photo above, 20 Duriron Anodes were jetted into place WITHOUT BACKFILL using a high velocity stream of water and were placed with the top of the anodes 3 feet below the surface. *Each anode was in position within 60 seconds.*

The group of anodes produced an average of 33 amps at 36 volts with no tendency to gas block. Actually, the bed resistance has decreased since the original installation. There was considerable cost-saving in the elimination of carbonaceous backfill.

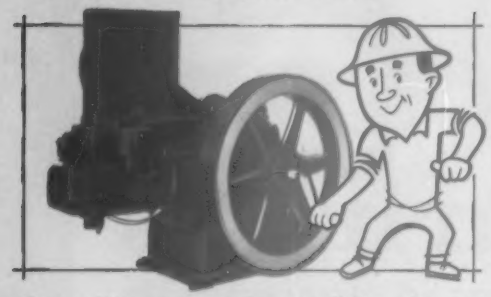
For latest data and case histories on fresh water, salt water, and ground bed application, write for Bulletin DA/6.

Water jetting of Duriron Anodes has been successfully applied in clay, shale and sand.

make Duriron Anodes your guarantee for cathodic protection

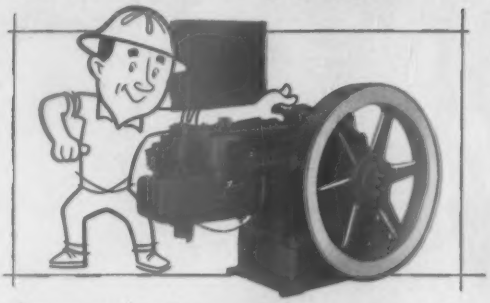
THE DURIRON COMPANY, INC.
DAYTON, OHIO

EASY TO START

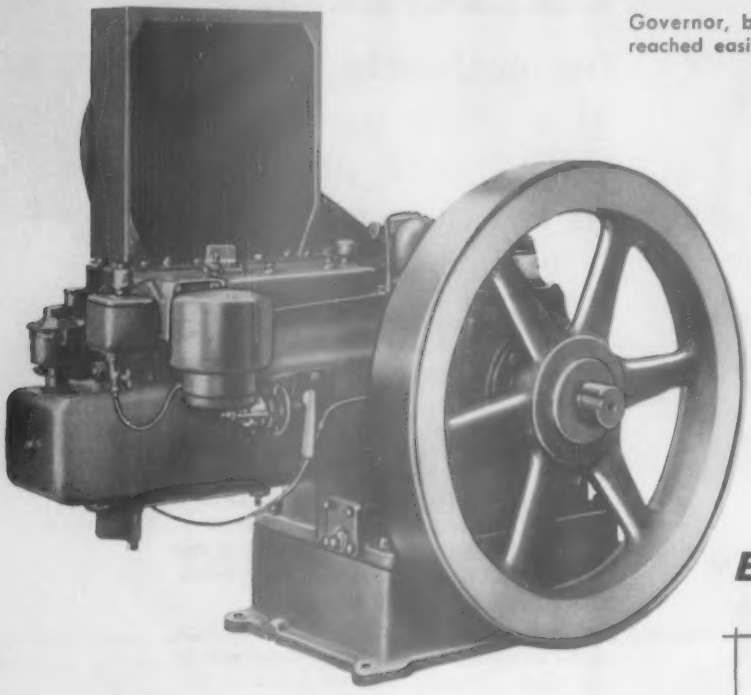


Hot, cold or wet weather conditions do not prevent C-E Engines from starting easily.

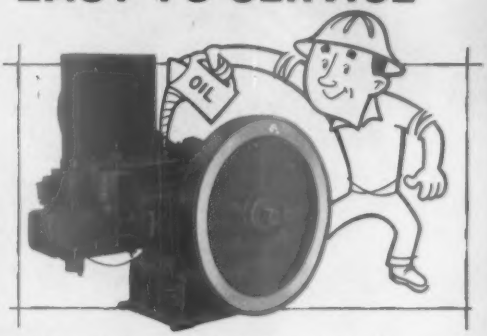
EASY TO ADJUST



Governor, bearings, carburetor, etc. can be reached easily for quick, accurate adjustment.



EASY TO SERVICE



Water or oil can be added . . their levels checked . . while the engine is running.

EASY TO REPAIR

Essential working parts or unit assemblies . . can be replaced in the field without disturbing other assemblies.

C-E Engines Cut Pumping Costs

It takes less time to service and maintain these engines, so more engines can be checked by fewer field men. Take advantage of this lower cost maintenance . . buy your next pumping engines from Continental-Emsco . . and reduce your production costs.

For Service that Sings . . Equipment that Hums . . Go . .

CONTINENTAL-EMSCO

Serving the Oil and Gas Industries ... Worldwide

CE702

CONTINENTAL-EMSCO COMPANY • A Division of The Youngstown Sheet and Tube Company • General Offices: Dallas, Texas
Export Division: 30 Rockefeller Plaza, New York, N. Y. • Continental-Emsco Company Limited • General Offices: Calgary, Alberta, Canada
Continental-Emsco Company C. A., Caracas, Venezuela • Plants: Houston and Garland, Texas; St. Albans, Herts., England • *Representatives in All Principal Oil Fields of the World*

News! The best features of
modern bearing design combined and refined in

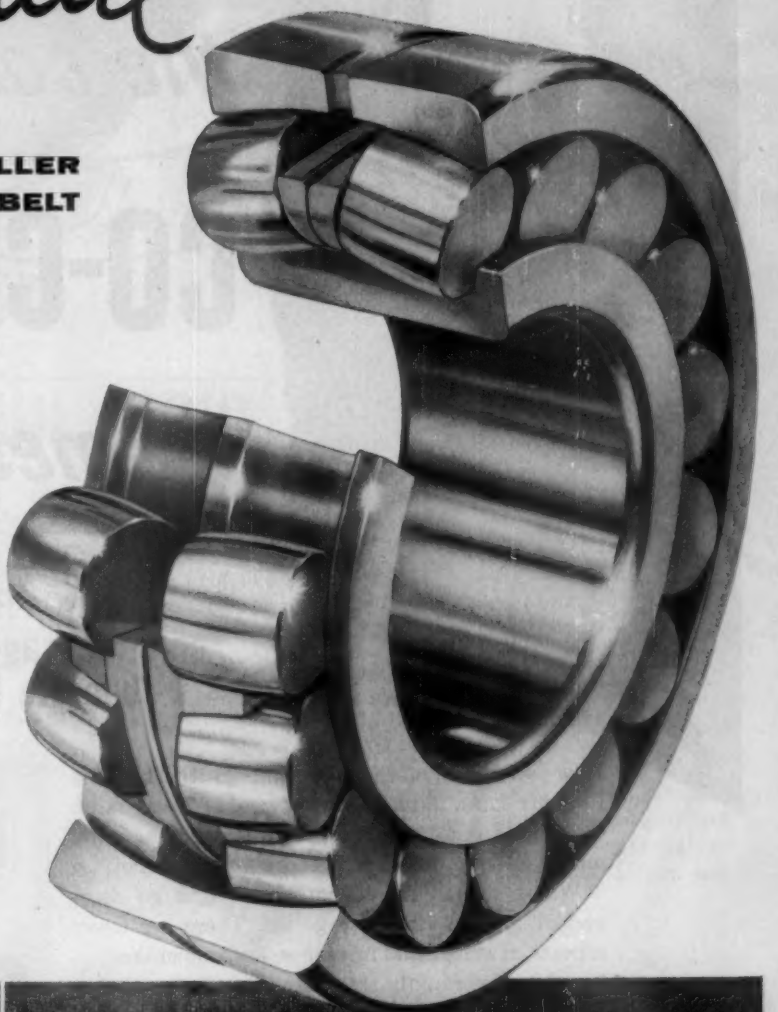
Spherical

SELF-ALIGNING ROLLER BEARINGS BY LINK-BELT

BIG, mirror-smooth convex rollers *plus* heavy, broad-shouldered inner race *plus* centrifugally-cast bronze, precision-machined retainers! Only from Link-Belt do you get ALL that is best in modern bearing design.

Individually, these elements represent major improvements on accepted design concepts. Collectively, they constitute the most efficient spherical roller bearings available . . . promise unequalled economies, whatever the application.

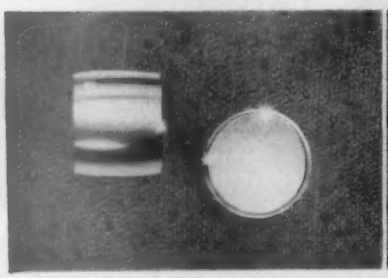
Your Link-Belt office or authorized stock-carrying distributor will gladly explain the many performance advantages evolved with this new design. And either can furnish full data on industry's most complete line of ball and roller bearings . . . pillow blocks and flanged, flanged-cartridge, cartridge and take-up blocks.



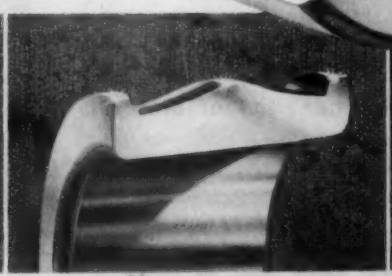
LINK-BELT

MANUFACTURERS OF SELF-ALIGNING BALL AND ROLLER BEARINGS

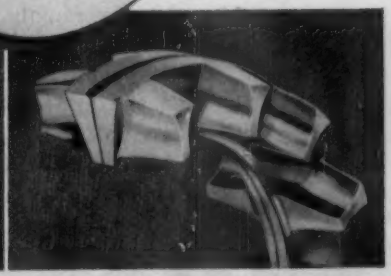
LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 26, Odessa, Tex., New Orleans 16, Shreveport, La., Los Angeles 22 (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 14,619-B



BIG, HIGHEST-CAPACITY ROLLERS. Each bearing has a maximum number of rollers—as large as possible, yet all components are in optimum balance.



HIGH, HEAVY INNER RACE FLANGES present convenient hold for assembly and removal of bearing without cutting away shaft, avoid any need to skimp on shaft shoulders.



PRECISION-MACHINED, CENTRIFUGALLY-CAST BRONZE RETAINERS have many times more support and ability to withstand high stress. They are not stampings. Design assures maximum bearing efficiency.

STOP

the confusion of

CO-CHANNEL

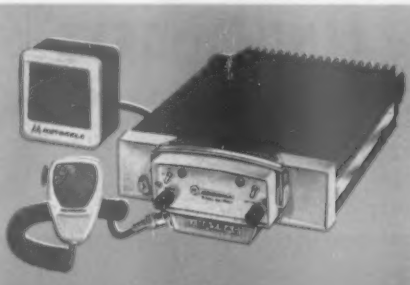
messages

with PRIVATE-LINE RADIO only messages with your own signal code are heard by your drivers

Now you can get off the "party line" with Motorola PRIVATE-LINE radio—the new kind of 2-way radio that shuts out the constant stream of annoying messages from others who share your channel.

Watch driver and dispatcher fatigue go *down* and all-around efficiency go *up*. There are fewer repeats, fewer missed messages, fewer mistakes . . . benefits that rapidly translate into improved customer service, greater productivity, and greater profits for you.

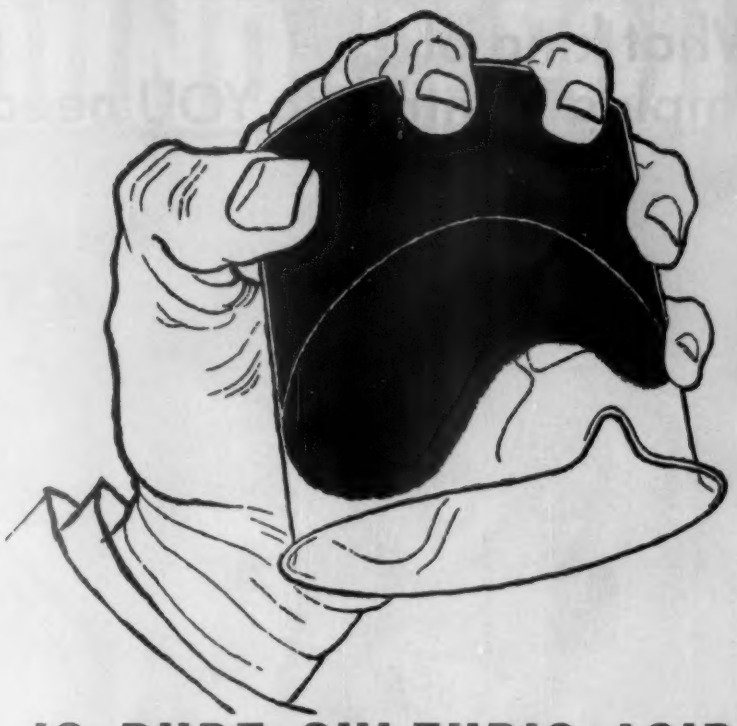
Put the added dependability of Motorola PRIVATE-LINE radio to work for you—as more and more users are doing. Write or phone for complete information.



PRIVATE-LINE operation is now available in the new MOTRAC radio with completely transistorized power supply and receiver. You get greater reliability and save on gasoline, engine wear and batteries.

MOTOROLA *PRIVATE-LINE 2-WAY RADIO*

Motorola Communications & Electronics, Inc., 4501 Augusta Blvd., Chicago 51, Illinois, A Subsidiary of Motorola Inc.



X% IS PURE SULFURIC ACID...

but how do you salvage it?

Send a sample of *your* Spent Sulfuric Acid to Stauffer for analysis and report. You will benefit from the massive experience of the largest spent acid regeneration facilities in the country...larger, indeed, than all others combined.

These facilities enable us to store and process spent acid wastes from the manufacture of lube oil, naphtha, DDT, benzene, alkylation, alcohol, white oil, detergent and other chemicals or from other manufacturing operations. Long experience and proved methods enable us to blend quantities and varieties of acid wastes in compatible burning mixtures from which we recover water-white sulfuric acid. This is delivered to you by tank car, tank truck or barge ready for use at specified strengths precise to 1/10th of 1%.

Contract regeneration of spent sulfuric acid eliminates your problems of acid separation and concentration, air and stream pollution and maintenance of equipment.

Let's get together and discuss your acid waste problem so we can make proposals regarding method of collection and shipment, regeneration point, rate and cost of recovery, etc. "If you can pump it, we can regenerate it!"

STAUFFER'S SULFURIC ACID FROM . . .

*BATON ROUGE, LA. • *BAYTOWN, TEX. • CORPUS CHRISTI, TEX. • FORT WORTH, TEX. • *HAMMOND, IND.
*HOUSTON, TEX. • LeMOYNE, ALA. • *LOS ANGELES, CALIF. • RICHMOND, CALIF. • TACOMA, WASH.

*Regeneration Plants.

STAUFFER CHEMICAL COMPANY

380 Madison Avenue, New York 17, New York
Prudential Plaza, Chicago 1, Illinois — 636 California Street, San Francisco 8, California
824 Wilshire Boulevard, Los Angeles 17, California — P. O. Box 9716, Houston 15, Texas

CONSOLIDATED CHEMICAL INDUSTRIES DIVISION, 6910 Fannin St., Houston 25, Texas

"What kind of Pumping Control do YOU need?"

Square D can deliver it from Stock!

BASIC PANEL can be tailored to fit your needs—

- NEMA Type 3 "weatherproof" enclosure protects against rain, sleet, hail, snow and dust.
- simplified installation—convenient knockouts for easy wiring, designed for either wall or pole mounting, or available with pedestal mounting feet if desired
- oversized enclosure permits field installation of additional features if required
- choice of fusible disconnect switch or circuit breaker
- HAND-OFF-AUTO selector switch
- available in ratings up to NEMA Size 4 to handle up to 100 hp

COMPLETE PROGRAMMING PANEL has every feature you need for oil well pumping—

- two types—one for operation up to 600 volts, another for 762-volt systems
- gasketed inner door isolates "live" parts—NEMA Type 3 enclosure gives complete weather protection
- overload relays in separate ventilated compartment to prevent nuisance tripping
- time clock has trip tabs for easy pumping program setup
- undervoltage release relay drops out on power failure, provides time-delay restart for staggered starting when power is restored
- built-in lightning arrester

Write for Bulletin 8944. Square D Company, 4041 North Richards Street, Milwaukee 12, Wis.

SQUARE D COMPANY

—wherever electricity is distributed and controlled

FOUND IN THE FOUNDRY

Fig. 3671—2½" to 3½" x 6" Triplex Plunger Pump. Capacities of 191 to 375 barrels per hour at working pressures from 1575 to 800 PSI.

. . . One of the Secrets of GASO'S 44-Year Record of Leadership

No pump is stronger than the metal from which it is made, and no pump manufacturer casts his metal to more rigid specifications than Gaso. Here experienced foundry-men are preparing the mold for a Gaso power frame. Into it will be poured a special formula of molybdenum alloy cast iron. Test bars, sent regularly to a nationally known laboratory, consistently show a tensile strength of 45,000 to 48,000 lbs. per square inch. Another reason for the ruggedness of Gaso Pumps, their ability to withstand the shocks and strains of tough use, and their habit of outliving ordinary pumps . . . Latest catalog on request.

DISTRIBUTORS:

Farmington, N. M.—Gaso Pump & Burner Mfg. Co.
Shreveport, La.—W. L. Somner Co.
Odessa, Texas—W. L. Somner Co.
Brookhaven, Miss.—W. L. Somner Co.
Tinsley, Miss.—W. L. Somner Co.
Hobbs, N. M.—W. L. Somner Co.
Houston, Texas—Peddlers, Inc.
Wichita Falls, Texas—Pump Engineering Co.
Evansville, Indiana—Hague Equipment Co., Inc.
Long Beach, Calif.—Power Pumps, Inc.
Casper, Wyoming—Lufkin Foundry & Machine Co.
Edmonton, Alberta, Canada—Lufkin Machine Co., Ltd.

GASO PUMP & BURNER MFG. CO. • Export Office: Empire State Building
901 East First Street, Tulsa, Oklahoma — New York, N. Y.

GASO PUMPS
for every oil industry need

100th Anniversary of Oil in America — 1959 — **44th Anniversary of Gaso Leadership**

"ABOVE GROUND" PREPARATION means

BETTER "DOWNHOLE" CEMENTING

Oil well cementing is built into the "above ground" composition of the cement slurry. Halliburton bulk materials handling plants are the best equipped to mix, by means of modern batch mixing equipment, the required additives and bulk cement, to meet most specified well conditions. These mixtures, in carefully regulated proportions and homogenously blended, are delivered to the well site in Halliburton Waterproof Bulk Cement Convoys. Bulk Cementing, through its tailored slurries and savings in cost, plays an ever-increasing part in providing superior oil well protection.

Better cementing begins at the Halliburton bulk cementing materials handling plant and provides maximum protection downhole, helping to reduce the many hazards of corrosion and contamination within your well. For your oil and gas well cementing requirements, call Halliburton, the pioneer in bulk cementing since 1940.

"CONTINUE TO LOOK TO HALLIBURTON – FOR LEADERSHIP"

HALLIBURTON

Halliburton Special Cements and Additives that Help Give Your Well Better Protection

HI-DENSE NO. 2

A high specific gravity (4.7) weighting material, designed to increase density of cement slurry for controlling high pressure oil and gas zones. Processed to a fineness requiring a minimum amount of mixing water, Hi-Dense No. 2, makes it possible to weight cement slurries to 20 lbs./gal., yet maintain adequate pumpability and strength stability at higher temperatures.

LATEX CEMENT

A low fluid loss cement composition with superior perforating properties. Especially recommended for primary cementing, squeeze cementing, cementing liners and "tailing-in" on primary cementing jobs. Latex Cement has high resistance to acid and corrosive well fluids; Latex increases resiliency and bonding properties of cement. Slurries may be accelerated or retarded without altering the low fluid loss properties.

RADIOACTIVE TRACERS

Halliburton Radioactive Tracers RAC-2 and RAC-3 are useful in the location of cement after placement in the well. The location and disposition of squeeze cement, channels and communicating zones may be accomplished ... even after multiple stage cementing jobs. The condition of cement around the shoe and through definite zones may be ascertained. The half-life of the material permits safer, surer location of cementing for a few months after the original job.

MUD-KIL

A dry, granular additive for cement that effectively neutralizes the cement-retarding properties of mud treating chemicals such as quebracho and other tannins, starch, sodium carboxymethylcellulose and lignite. Pumping time and compressive strengths of cement are not appreciably altered. Primary applications are for open hole plug-back, liner jobs, squeeze cementing or in "tailing-out" on primary casing jobs.

POZMIX CEMENT

Pozzolanic cements help provide maximum oil well protection against corrosion, contamination and ineffective bonding between pipe and formation. Pozmix Cement, a blend of Pozmix and portland cement designed for wells of moderate temperatures, may be used with chemical additives, such as retarders, accelerators, and low fluid loss agents, for better control during the cementing operation.

SATURATED SALT WATER

A dual purpose additive that both retards the set of portland or Pozmix Cement and also improves the bonding properties to salt formations. The blending of granulated salt in the dry cement eliminates foaming and delay in dissolving salt in water before mixing with cement. Does not dissolve the salt as would occur with the circulation of fresh water slurries. In moderately deep wells, Salt Cement does not require retardation, as set is sufficiently delayed to permit placement.

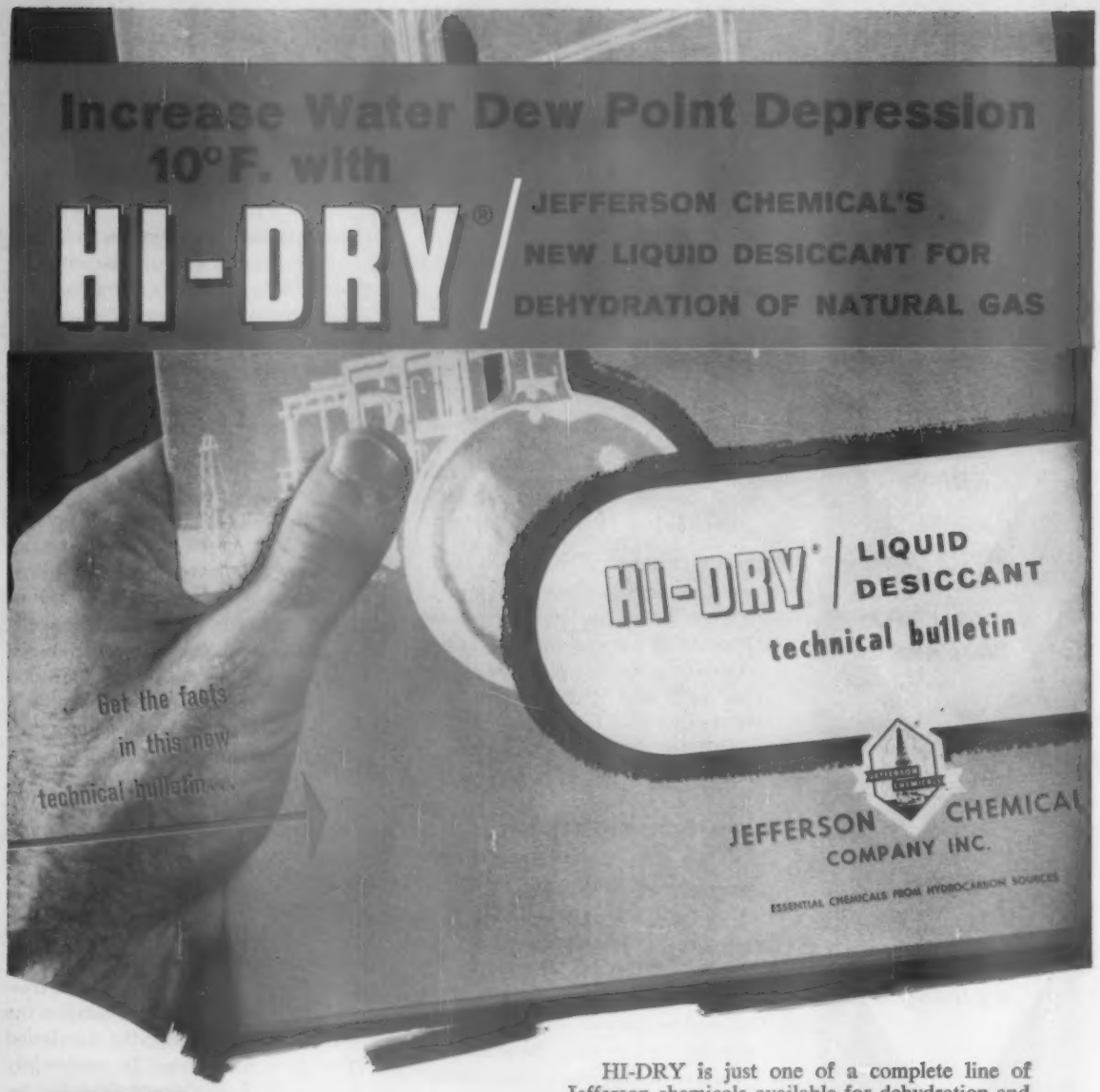
DIACEL D

Diacel D, a low density composition, is used to produce a light weight slurry with portland cement, by increasing the volume of mixing water, resulting in a lighter weight slurry and a greater yield.

284 SERVICE CENTERS – JUST MINUTES AWAY FROM YOUR WELL

CEMENTING SERVICES

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA



HI-DRY® brand liquid desiccant is a tetraethylene glycol concentrate developed specifically to give you the extra dew point depression so often needed in the dehydration of natural gas. Extensive field tests indicate that reconcentration of HI-DRY at 435°F. and triethylene glycol at 375°F. are comparable in level of thermal stability. The lower vapor pressure of HI-DRY, in addition to the increased degree of reconcentration achievable due to its greater thermal stability, offers an advantage in the dehydration of higher temperature gas streams such as those experienced at compressor stations.

Provided in this new HI-DRY technical bulletin are sales specifications, shipping information, typical applications and physical properties. From the physical properties you may readily estimate the results obtainable with various operating conditions.

HI-DRY is just one of a complete line of Jefferson chemicals available for dehydration and sweetening. Jefferson's extensive background of experience in gas treating processes is at your disposal. For helpful technical services, samples of HI-DRY liquid desiccant, or the new HI-DRY technical bulletin . . . contact Jefferson Chemical Company, Inc., 1121 Walker Avenue, P. O. Box 303, Houston 1, Texas.

JEFFERSON CHEMICAL COMPANY, INC.

HOUSTON • NEW YORK • CHICAGO • CLEVELAND
CHARLOTTE • LOS ANGELES

Ethylene and Propylene Oxides, Glycols, Dichlorides • Ethanolamines
Morpholine • Piperazine • Polyethylene Glycols • Nonyl Phenol
SURFONIC® Surface-Active Agents • Ethylene and Propylene Carbonates
Caustic Potash • Caustic Soda • Soda Ash • Sodium Bicarbonate

Essential Chemicals From Hydrocarbon Sources

HOT

A demand item—in less than a year! In the short time since its introduction, the JOHN DEERE "440" CRAWLER with field-proved DIESEL ENGINE has established a new high standard of performance for industrial units in its class.

In building construction, logging, public works and other industrial fields, the new "440ICD" is now daily proving its right to the claim of . . .

"Low-Cost Power with a Heavyweight Punch"

JOHN DEERE

John Deere Industrial Division, Dept. 2087, Moline, Illinois

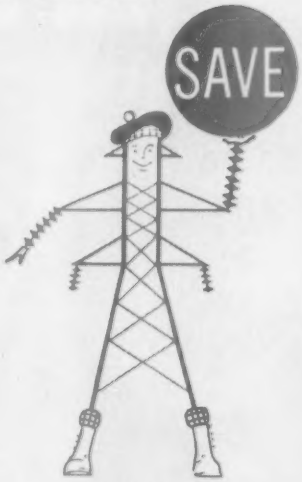
You can depend on purchased electric power for

REMOTE CONTROL

Remote-controlled crude station with three 1250 hp and one 200 hp electric motors

This remote-controlled crude station is typical of the modern trend in electrification. In addition to the four electric motors, the valves and sump pump are all controlled from a town some distance away. This installation is dependably served with utility electric power and a fine example of adaptability of purchased power to remote control.

For pipelines, as well as for producing fields and refineries, you can always depend on utility electric power. See your nearest utility electric power company for assistance or write the Petroleum Electric Power Association.



Purchased Electric Power . . . saves money, manpower, maintenance, and serves you better automatically

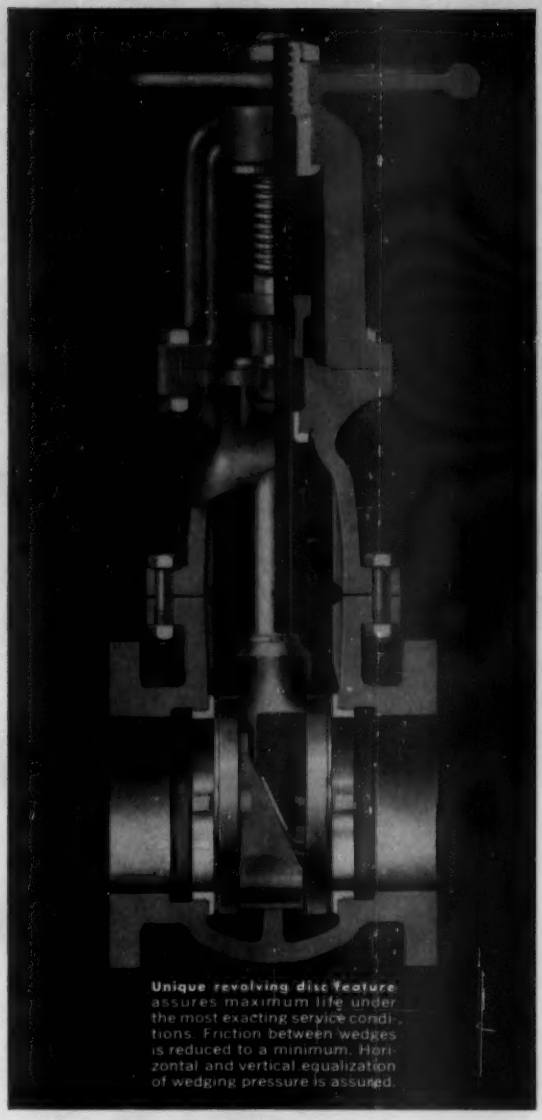
Petroleum Electric Power Association P. O. BOX 35006. DALLAS 35, TEXAS

FOR SEVERE CORROSIVE CONDITIONS

Specify

ALUMINUM GATE VALVES

by Darling



Unique revolving disc feature assures maximum life under the most exacting service conditions. Friction between wedges is reduced to a minimum. Horizontal and vertical equalization of wedging pressure is assured.

Handling corrosive chemicals such as hydrogen peroxide, ammonium nitrate, acetic acid, concentrated nitric acid? Darling Aluminum Gate Valves give you longer life, cut maintenance costs, under these and other severe service conditions. Here's why:

Darling metallurgical engineers have thoroughly tested and standardized on the most highly corrosion-resistant aluminum alloys in use today.

Accurate casting control and precision assembly reduces friction and wear, provides maximum ease of operation.

Darling Double Disc Parallel Seat principle assures freedom from leakage, trouble and downtime.

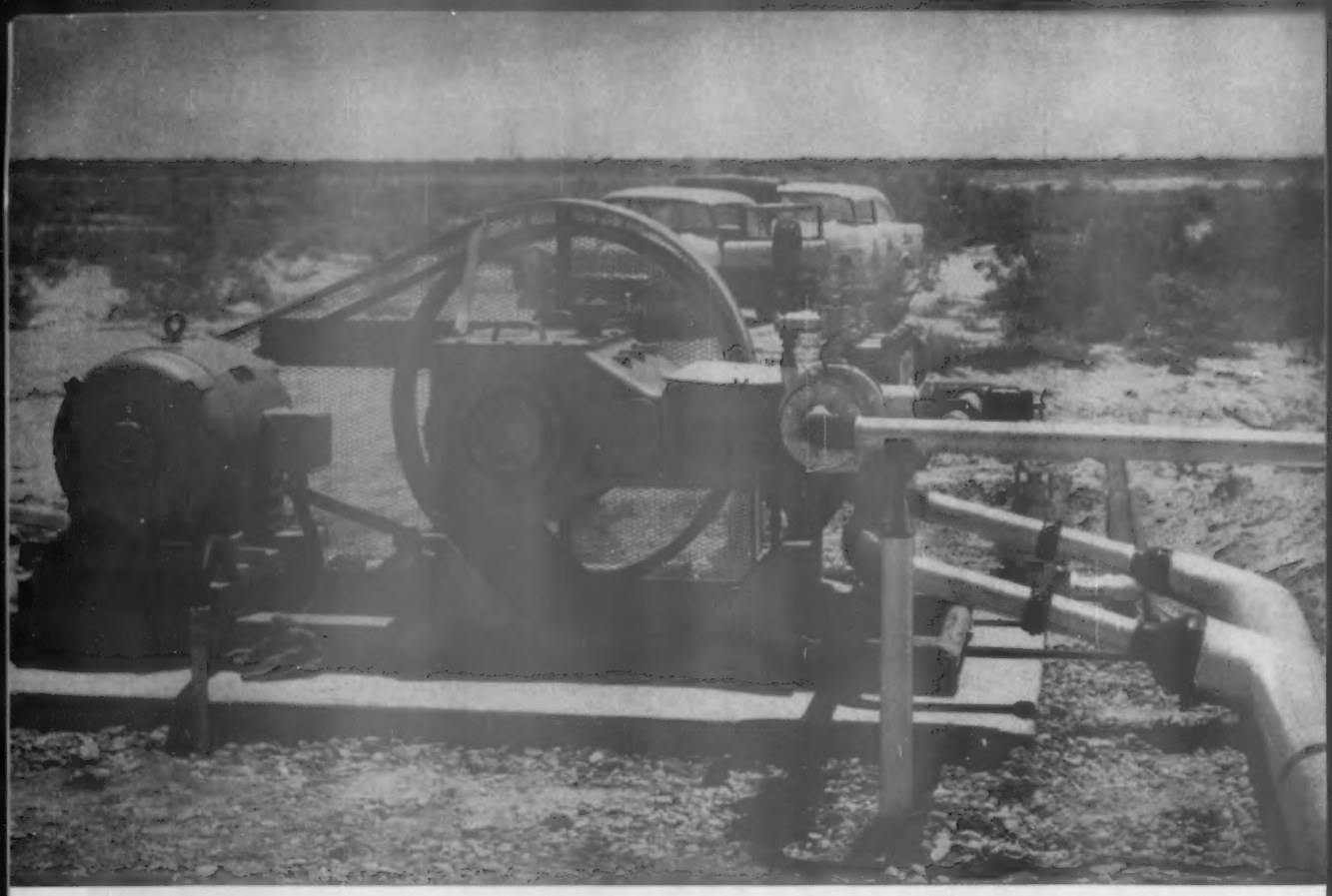
Darling aluminum alloy valves are available in sizes from ½" through 24". Write us about your requirements and service conditions.

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.

DARLING
DARLING
VALVES



30 hp Century Electric motor driving reciprocating pump in Texas water flooding project.

From Century Electric . . .

Steady power for water flooding

Here's thirty tough horsepower of dependable motor. Driving a reciprocating pump in a Texas water flooding project, it has to be on the job 24 hours a day with power ready when needed. But maintenance is no problem. Century Electric motors are built to take the rugged punishment of any oil industry operation—in drilling, production, pipe line and refining.

Here's why you get top performance with Century Electric motors:

Motors matched to equipment—Load cycle of your equipment can be matched precisely by the performance characteristics of the motor . . . means you get power when and where you want it. Your equipment lasts longer too because power is smooth and dependable . . . no jars or shocks. You get immediate delivery from stock on standard motors . . . or Century Electric can build special motors to fit your requirements.

Long life—Extra layers of tough insulation fight off dirt, dust and moisture. And sturdy enclosures protect against elements. Enclosures like: *drip-proof*, *splash-proof*, *dust-proof* and *explosion-proof*. Screens on open motors keep out rodents.

Motors up to 400 HP—From Century Electric you can get motors up to 400 hp for any application—for shale shakers, pumping units, fans, blowers, pipe line and power oil pumps.

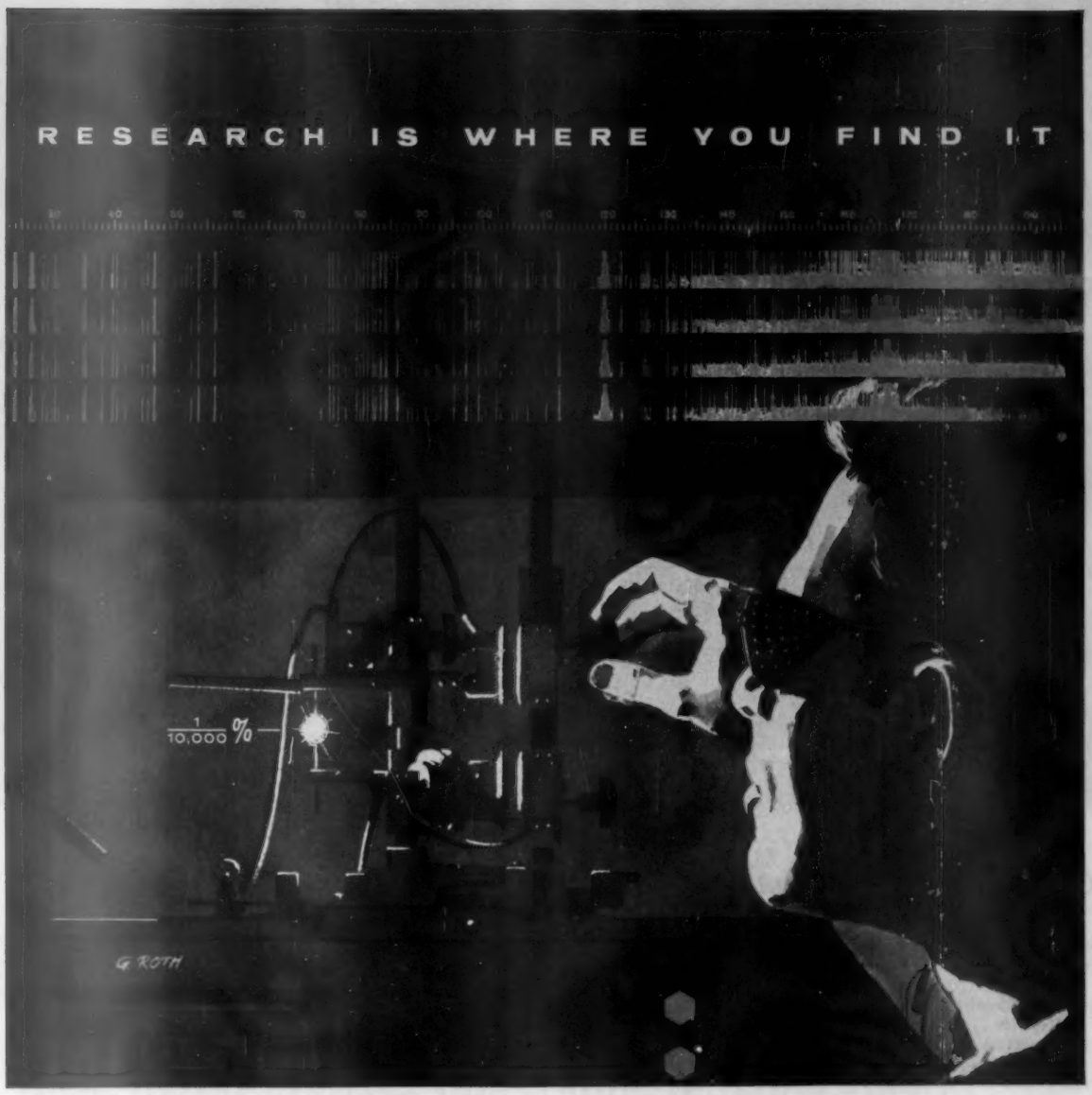
You get *more* than just a motor from Century Electric—you get motors matched to your equipment, plus one that's built for *long* life. For more information contact your nearest Century Electric Sales Office or your supply store.

CENTURY ELECTRIC COMPANY

St. Louis 3, Missouri *Offices and Stock Points in Principal Cities*

Century

58-25



The telltale wavelength

As little as 0.0001% of an unwanted "trace metal" in crude oil can cause a refiner to lose his temper . . . perhaps his shirt!

It may generate enough gas to choke his plant . . . drastically increase his catalyst requirements . . . or reduce yields of desired products to below the profit point.

Determining the nature and accurately measuring the amount of such harmful "impurities" present in a crude oil is standard procedure in Universal's research labs. The wavelength, obtained through spectroscopic analysis, identifies the metal and enables the measurement of its concentration.

Supercritical measurements such as this . . . or detecting as little as 0.0000001% of the metal . . . are typical ingredients of UOP research. That is why refiners the free world over depend on the kind of research they find at UOP.

UOP

UNIVERSAL OIL PRODUCTS COMPANY 30 ALGONQUIN ROAD
DES PLAINES, ILLINOIS, U. S. A.
More Than Forty Years Of Leadership In Petroleum Refining Technology

Can you meet the challenge of this new day in bulk transportation?

Will you be in the running when the pipeline industry's biggest new job starts taking shape?

Solids by pipeline is no longer a dream. It's a highly successful reality.

Gilsonite . . . coal . . . *what raw material will be next* to start moving to market through a pipe?

As you get set to meet the mighty challenge and opportunity that solids pipelining presents to your industry, remember this:

1. Men who engineer solids pipeline systems find that *uniform concentration* of solids is a must in a pipelined slurry.
2. You can get the slurry uniformity you want—with LIGHTNIN Mixers.

LIGHTNIN Side Entering Mixers keep 700 tons of solids per day uniformly suspended for dispatch through the pioneer American Gilsonite Co. pipeline. LIGHTNINs in thousands of chemical plants mix slurries of every kind, rapidly, dependably—*to the exact level of uniformity needed.* If it can be slurried, you can slurry it *uniformly* with LIGHTNINs.

If you'd like quick, competent help on slurry suspension for a specific project, call in your LIGHTNIN Mixer representative now. He's listed in Pipeline Composite Catalog. Or write us in confidence.

Good mixing helps move Gilsonite over a mountain

Solids pipeline built by American Gilsonite Co. makes the refining of gasoline from Gilsonite economically possible. It saves more than $4 per ton—a million dollars a year—over other methods of transporting Gilsonite ore over a mountain from mine to refinery.

American Gilsonite's 6-inch pipeline carries slurries averaging 38% solids and 62% water at 350 gallons per minute. It delivers more than 700 tons of solids per day at the downstream end, 80 miles from the eastern Utah mine.

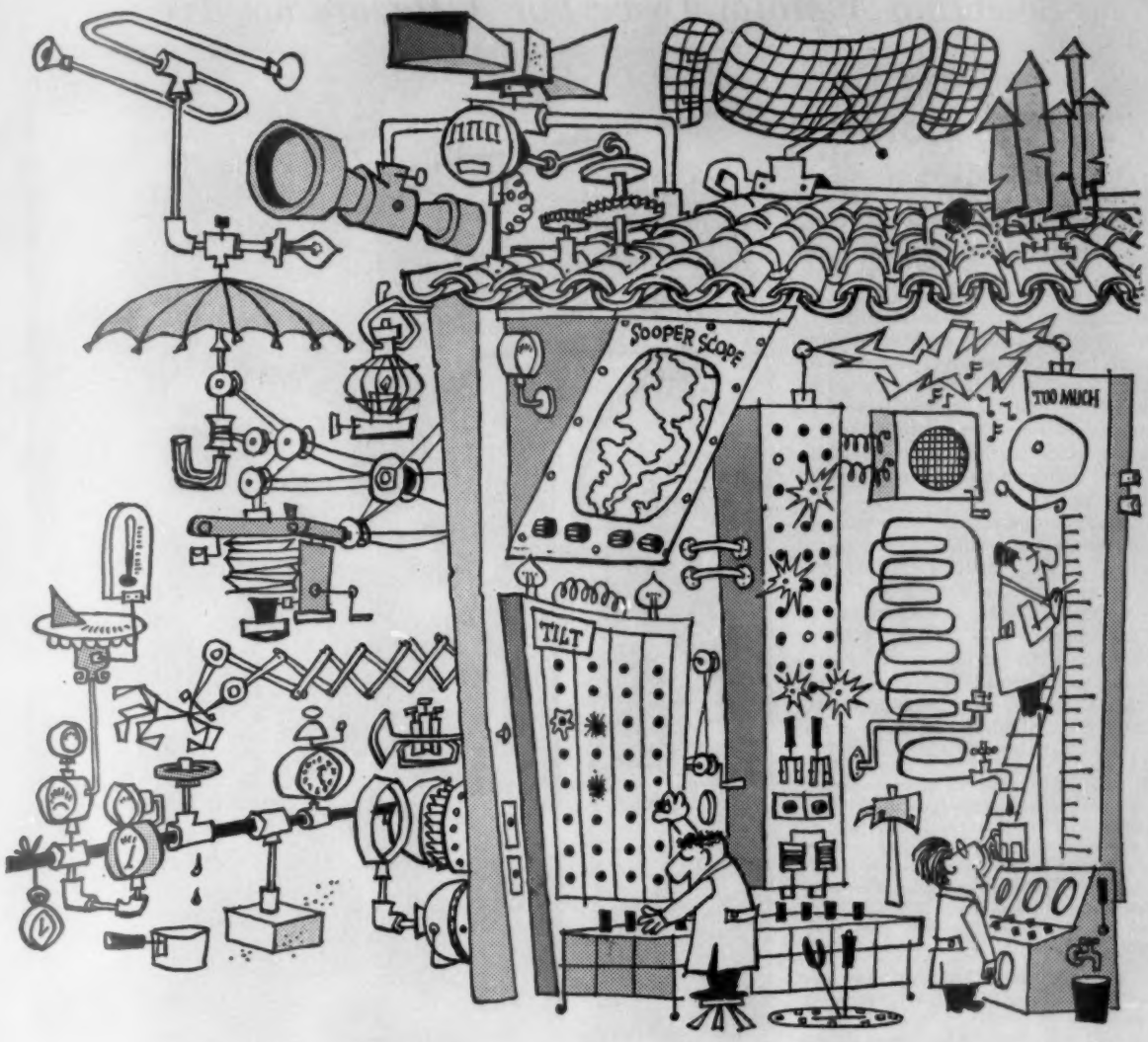
Cut from the solid vein with high-pressure jets of water, the shattered ore is flumed more than a mile underground to the bottom of the 800-foot-deep central shaft.

Then the ore is screened to 8-mesh maximum, pumped to the surface with fluming water, and mixed to uniformity in 200,000-gallon holding tanks equipped with LIGHTNIN Side Entering Mixers.

Lightnin® Mixers MIXCO fluid mixing specialists

MIXING EQUIPMENT Co., Inc., 174-m Mt. Read Blvd., Rochester 3, N. Y.

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 19, Ont.



How much control does your pipeline need?

If you have some imagination, like our artist, you can go hog-wild in working out a pipeline control system. If you really wanted it, Union Switch & Signal could even give you a digital read-out of your mother-in-law's blood pressure a thousand miles away.

But clean engineering requires just the right amount of control. We've learned, after 78 years of hard knocks in the control business, that overdesign is just as bad as underdesign. We all strive for positive, reliable, informative, labor-saving control. No more. No less.

Union Centralized Transport Control can remotely operate a single booster station or an entire system. It can provide automatic sequencing, telemetering, data handling and display, data logging, instrumentation and communications.

Union CTC will lower your operating costs, and it is completely error-free. It's a new concept in pipeline control. Write to us so we can tell you about it.

"Pioneers in Push-Button Science"

UNION SWITCH & SIGNAL
DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY
PITTSBURGH 18, PENNSYLVANIA

Selecting A Motor Drive For A Hazardous Area?

Here's how

TEIGF motors

by E-M

provide safe, dependable, economical power

Faced with the problem of driving hydrogen compressors in atmospheres which might contain hydrocarbons at their Baltimore refinery, engineers of Esso Standard Oil Company turned to TEIGF (Totally Enclosed Inert Gas Filled) Motors. Horsepower requirements exceeded the practicable limits under which explosion-proof motors could be used.

An important consideration was getting the greatest possible drive economy while operating safely in a possible hydrogen atmosphere. Three E-M 350 hp, 390 rpm TEIGF Motors are on duty at Esso Standard Oil Company fulfilling these important qualifications.

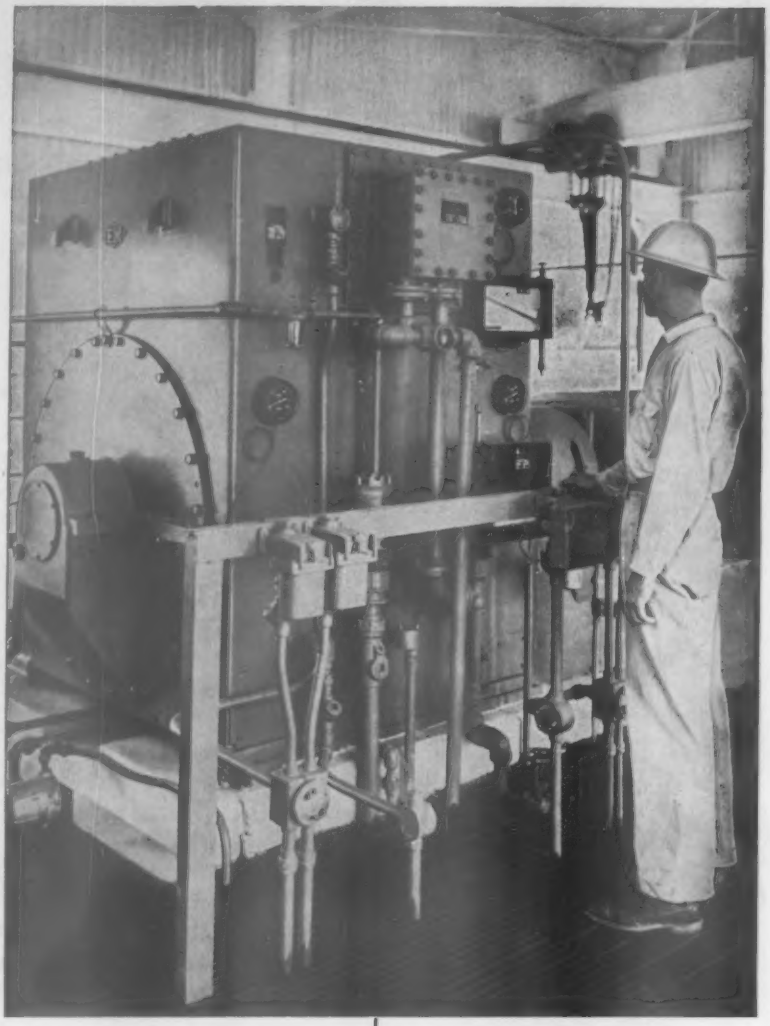
For Esso Standard Oil Company and other companies with similar problems, these E-M Motors offer three main groups of advantages:

1. SAFETY — Within the motor enclosure, inert gas pressure above atmospheric keeps explosive hydrogen *out*. A series of features help accomplish complete safety . . . inert gas pressure gauges . . . temperature gauges . . . purging valves, etc. and a full line of optional equipment. The E-M TEIGF Motor can be "customized" to meet your needs exactly.

2. RUGGED DEPENDABILITY. E-M uses specially designed "box type" frames of heavy-duty plate steel reinforced with heavy bar-stock ribs. They cannot twist or distort. Air gap is accurate and permanent, as all frame welding is completed before precision boring. Ventilating gas passages are carefully engineered to provide unimpeded gas flow for optimum cooling.

3. ECONOMICAL OPERATION. In E-M TEIGF Motors, gas loss is lower than commercially accepted standards. Specially designed shaft seals are oil-pressure gas-sealed bearing type, virtually non-wearing. Where bolts enter outside casing, E-M engineers specify blind holes . . . tapping and drilling are done *into* casing, not through. Operating and maintenance costs are at a minimum.

Consult your nearest E-M sales engineer, or write the factory for TEIGF Motor Bulletin No. 226.



TYPICAL STANDARD FEATURES INCLUDE:

1. Top-mounted gas-to-water cooler for use with suitable cooling water supply.
2. Forced-feed lubricated bearings and oil-pressure gas seals.
3. Oil pump, motor and oil filter. (Can be supplied optionally inside enclosure.)
4. Inert-gas temperature gauge.
5. Inert-gas pressure gauge.

(additional features shown in Bulletin No. 226)

TYPICAL OPTIONAL FEATURES INCLUDE:

1. Water cooler with double-tube construction for added protection against leakage.
2. Liquid level detector switch. Accumulation of moisture within motor sounds alarm or shuts down motor.
3. Bearing temperature relays, to sound alarm or shut down motor.
4. Explosion-proof motor terminal pothead or inert-gas filled terminal box.
5. Water flow indicator. Can be adapted for use with pneumatic-type regulating device.

ELECTRIC MACHINERY MFG. COMPANY

MINNEAPOLIS 13, MINNESOTA

Specialists in making motors do

EXACTLY WHAT YOU WANT THEM TO

1300—TPA—2179

LOOKING FOR MORE HEAT

FROM THE FUEL YOU'RE NOW USING?

AN AIR PREHEATER CAN PUT AN EXTRA 1000° INTO YOUR FURNACE

You can get more heat – from the same amounts of your regular fuel – with a Ljungstrom® Air Preheater. An Air Preheater can recover as much as 1000°F from the exhaust of stills or boilers and return it to the combustion air of any kind of fuel-burning equipment. Extra furnace efficiency will in turn permit use of advanced boiler designs, finer controls and a more uniform, more profitable product.

You save fuel with preheated air, too. Even if you recover only 45°F from stack gas, you'll save 1% of your fuel bill. Recover 1000°F, and you can maintain present operating temperatures *on 20% less fuel.*

There's also less maintenance on a Ljungstrom-equipped furnace. Fuel burns more completely in preheated air, so there's less slag, fewer deposits, higher availability of equipment. What you save on maintenance and fuel alone will pay for your Air Preheater in two years or less. "Write-off" can be cut to *as little as nine months* if you use the extra capacity of a preheated furnace to boost product quality.

Free facts on fuel savings

One company's fuel savings with an Air Preheater are factually described in an article by Oliver F. Campbell. Write today for your free copy.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

Presenting New MARSH "*Master-Test*" SERIES

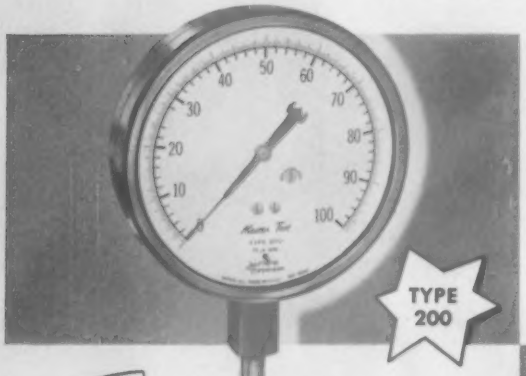
of extremely accurate test gauges

Crowning achievement in instrument making... this superb series of test gauges developed to meet today's exacting requirements of instrument men throughout industry. Accuracy and dependability beyond compare...each gauge individually dead-weight tested (think what that means!)...each gauge guaranteed accurate within ¼ of 1% plus or minus of the maximum dial reading over the entire range.

To provide reading accuracy in keeping with the accuracy of the instrument, all "Master-test" gauges have the simplified "Read-easy" dial (patent pending) illustrated opposite—a dial that can be read with the accuracy of a caliper, yet with the ease of a clock.

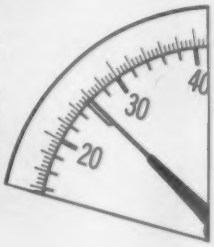
To further increase accuracy, three advanced means of reading have been developed as described below: the "twin-tip" pointer; the mirror path; the non-parallax dial.

"Master-test" gauges are available in sizes 4½", 6", 8"...in all standard ranges from 0-15 to 0-30,000 psi...in vacuum and compound types...in a full range of case patterns. Ask for 20 page bulletin.



← with "Twin-tip" pointer

The most common error in reading pressure occurs when the observer reads from an angle rather than "dead on". This Marsh "Twin-tip" pointer enables the operator to know when he is dead on by lining up the two tips so that only one is visible. The twin-point arrangement is similar to the sights on a rifle.

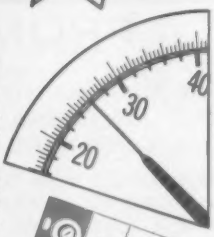


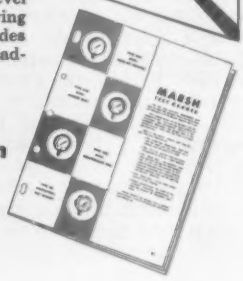
with mirror dial →

Another method of insuring accurate "dead on" reading. Knife edge pointer is reflected by the mirror path. When reflection is not seen, reading is dead on and true. The ease and accuracy with which the mirror dial may be read cannot be duplicated by any other mirror type dial. It is the combining of the mirror path with the exclusive Marsh "Read-easy" dial that makes this faster, error-free reading possible.

← with "Non-parallax" dial

This Marsh development eliminates mistakes in dial reading even if read at an angle. To accomplish it Marsh engineers designed a clear Plexiglas insert placed, as shown, over the fine graduations so that they appear to be at the same level as the pointer regardless of the viewing angle. The "Non-parallax" dial provides the easiest and most accurate dial reading available.





Ask for this 20 Page Bulletin

MARSH

THE STANDARD OF ACCURACY

MARSH INSTRUMENT COMPANY, Dept L, Skokie, Ill.

Division of Colorado Oil and Gas Corporation • **Marsh Instrument & Valve Co., (Canada) Ltd. 8307 103rd St., Edmonton, Alberta, Houston Branch Plant, 1121 Rothwell St., Sect. 15, Houston, Texas**

For extra high *strength wire rope...*

use **CF&I-Wickwire** *Double Gray*

The CF&I Image reflects CF&I's experience as a producer of many steel products and CF&I's versatility in developing new products to meet exacting requirements . . . like Wickwire Double Gray*.

The special steel used in Double Gray provides extra resistance to the deforming effects of peening and crushing which occur on the drums and sheaves of heavy equipment. Double Gray also gives extra resistance to abrasion.

Because of these superior qualities, Double Gray rope quickly repays its slightly higher initial cost in safer, more economical operations. Use it wherever extra high strength wire rope is required.

For a free copy of our Double Gray booklet, write to: Advertising Department, The Colorado Fuel and Iron Corporation, 575 Madison Avenue, New York 22, N. Y.

**Wickwire Double Gray Wire Rope is made of extra-improved plow steel. Fortified by an independent wire rope core of the same extra high strength steel, Double Gray rope has a 15% higher breaking strength than the catalog breaking strength of an improved plow steel rope with IWRC.*

5632

WICKWIRE ROPE

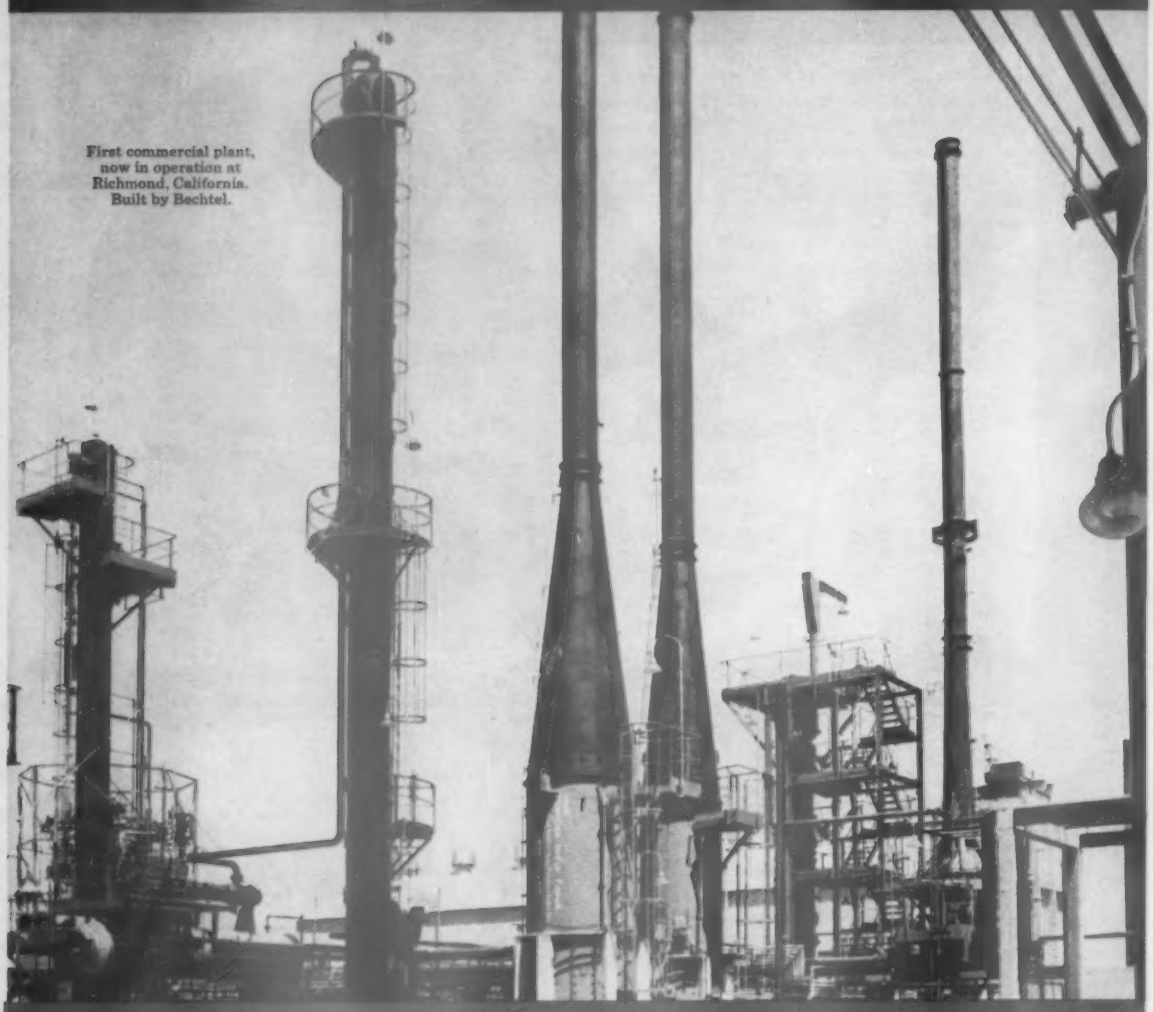
THE COLORADO FUEL AND IRON CORPORATION

In the West: THE COLORADO FUEL AND IRON CORPORATION—Albuquerque · Amarillo · Billings · Boise · Butte Denver · El Paso · Farmington (N.M.) · Fort Worth · Houston · Kansas City · Lincoln · Los Angeles · Oakland · Odessa (Tex.) Oklahoma City · Phoenix · Portland · Pueblo · Salt Lake City · San Francisco · San Leandro · Seattle · Spokane · Tulsa · Wichita

In the East: WICKWIRE SPENCER STEEL DIVISION—Boston · Buffalo · Chattanooga · Chicago · Detroit · Emlenton (Pa.) New Orleans · New York · Philadelphia

CF&I STEEL

ISOCRACKING* is here!



First commercial plant, now in operation at Richmond, California. Built by Bechtel.

LET BECHTEL show what this versatile hydrocracking process can do for you

ISOCRACKING PLANTS are available immediately through Bechtel Corporation and affiliated Bechtel companies—licensed to process design, engineer and construct plants employing this advanced new technique by its owners and developers, California Research Corporation.

Your inquiry is invited.

BECHTEL CORPORATION

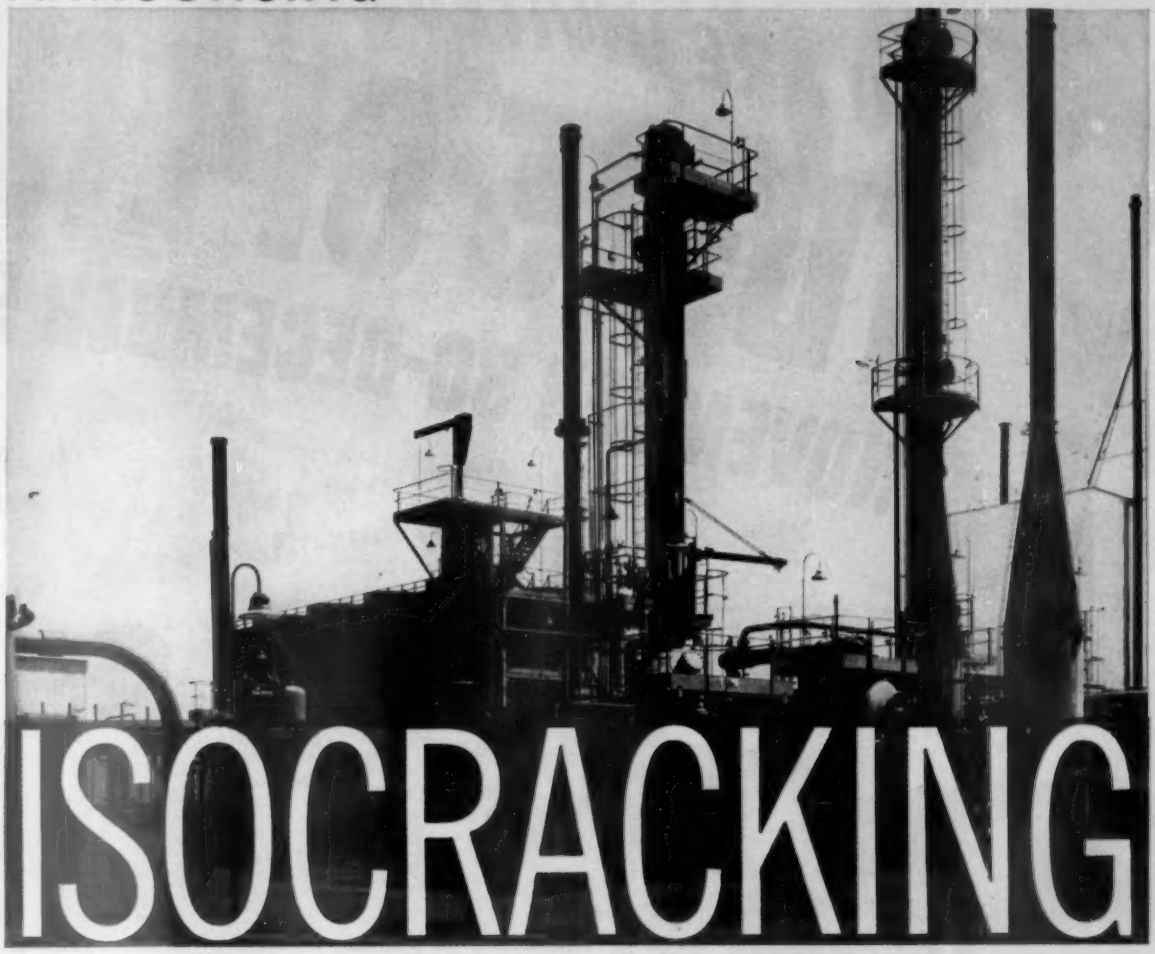
Engineers and Builders for Industry

SAN FRANCISCO

Los Angeles • New York • Houston

*Proprietary name of California Research Corporation

ANNOUNCING a significant advance in refinery technology available for license



ISOCRACKING

a commercially proven hydrocracking process

Today, in Richmond, California, the U. S. oil industry's first commercial Isocracking* plant is in full-scale operation.

Developed by California Research Corporation, the *Isocracking* Process is proving out benefits in refinery economics long predicted for hydrocracking. Under moderate processing conditions, *Isocracking* gives better than 100 per cent yield of over-103-octane gasoline blending stock from refractory light distillates.

Highly selective in its ability to make the gasoline molecules most in demand, *Isocracking* permits direct manufacture of desirable blending stocks. It produces light isoparaffins in substantial volume. Moreover, it is a flexible process with a wide variety of refinery applications.

The *Isocracking* Process is offered under license by California Research Corporation, and pilot plant facilities are available for evaluation of feed stocks. **We invite you to discuss *Isocracking* with our engineers, at the Chicago API meeting, November 8-12.**

For complete details, write for brochure:
California Research Corporation, 200 Bush St., San Francisco 20, Calif.

CALIFORNIA RESEARCH CORPORATION
A Standard Oil Company of California Subsidiary

*Proprietary Name

YOU ARE INVITED TO
TD-25 OPEN
NOVEMBER 30-DECEMBER 5
INTERNATIONAL
25
UIPMENT

HOUSE, U.S.A.

INTERNATIONAL HARVESTER COMPANY
180 NORTH MICHIGAN AVENUE • CHICAGO 1, ILLINOIS

An open invitation to profit-conscious contractors

At Open House, U.S.A., you won't be viewing "just another big tractor." Not on your life!

This is the big, new International TD-25's "coming out party." And the "25" is coming out "loaded for bear!"

At Open House, U.S.A., you'll preview a king-sized crawler that has more proven, high-output exclusive features than anything else on tracks...The new TD-25 is:

--the only king-sized crawler powered by the new 230-hp, 6-cylinder, direct-start DT-817 diesel--loaded with capacity-adding, life-prolonging features no other engine has!

--the only king-sized crawler with world-proved Planet Power steering, that gives you fingertip power-steering and Hi-Lo, on-the-go power-shifting. Full-time "live" power on both tracks adds payload capacity as no other crawler can!

--the only king-sized crawler with International-developed double-box-beam track frames, the industry's strongest; the only one carried on Dura Rollers--the rollers you can power-lubricate without affecting seal life or efficiency --the ones that make 1,000-hr lube checks practical!

--the only king-sized crawler with so many far-ahead features it can outearn competitive rigs up to 50%, on an amazing variety of tough jobs!

Watch for the word on when and where your Distributor will hold TD-25 Open House, U.S.A. And be there, for sure. Be one of the first to size up the profit-making advantages of the big, new International TD-25.

More productive power to you!,
International Harvester Company

International® Construction Equipment

International Harvester Co., 180 North Michigan Ave., Chicago 1, Illinois
A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers and Bottom Dump Wagons . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

the OIL AND GAS JOURNAL

TULSA OFFICE
211 South Cheyenne Avenue
Box 1260
Phone LUther 4-4411

George H. Weber ..... Editor
Henry D. Ralph .. Chief Editorial Writer
Ted A. Armstrong ..... News Editor
Gerald L. Farrar .... Engineering Editor
Frank J. Gardner .... Exploration Editor
Paul Reed ..... Pipeline Editor
W. L. Nelson ..... Technical Editor
Lynn M. Nichols .... Presentation Editor
John C. Casper ..... Economics Editor
W. B. Bleakley ..... Production Editor
Neil Williams ..... Associate Editor
Peter B. Bike ..... Geophysical Editor
Carl J. Lawrence ..... Asst. News Editor
Gene T. Kinney .... Asst. Pipeline Editor
R. B. Tuttle ..... Equipment Editor
C. Dudley Johnston ..... Art Director
E. P. Stadler ..... Staff Artist

Robert B. Bizal ..... Editorial Research
Carl Hoot ..... District Editor
John C. McCaslin ..... District Editor
W. A. Bachman ..... District Editor
Deacon New ..... District Editor
Merle F. Blakely ..... District Editor
Sara Duncan ..... District Editor
John H. Hyden ..... District Editor
Kenneth W. Brooks ..... District Editor
Max L. Batchelder .... Asst. Pres. Editor
Helen Brown ..... Editorial Assistant
Alice Burt ..... Editorial Assistant
Ailleen Cantrell ..... Editorial Assistant
Susan Boeckman ..... Editorial Assistant
Margaret Higgs ..... Editorial Assistant
Jo Jeanne Speaker ..... Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-1910

Paul Swain ..... International Editor
Ray G. Gibson ..... District Editor
John P. O'Donnell ..... District Editor

HOUSTON OFFICE
802 American Investors Building
Phone CApitol 4-7726

Ed McGhee ..... Drilling Editor
Howard M. Wilson ..... District Editor

DALLAS OFFICE
1238 Mercantile Building
Phone Riverside 8-3074
Robert J. Enright ..... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone MAdison 2-0722
D. H. Stormont ..... West Coast Editor
William T. Smith ..... District Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710
Clyde La Motte ..... Washington Editor

BUSINESS STAFF
P. C. Lavinger ..... President

S. H. Rourke .... Executive Vice President
Mitchell Tucker . Vice Pres. and Adv. Mgr.
Kenneth B. Barnes V.P., E. Hemis. Oper.
Hanson B. Pigman .. Circulation Manager
Donald W. Wilson .. Mgr. Industry Census
J. Parker Holland .. Production Manager

ADVERTISING STAFF

TULSA OFFICE
211 South Cheyenne Avenue
Phone LUther 4-4411
John D. Reilly .. Mid-Continent Manager
Roy E. Finley ..... District Manager
D. B. Miller ..... Classified Adv. Mgr.

PHILADELPHIA OFFICE
1059 Land Title Building
Broad and Chestnut Streets
LOcust 3-0118
John W. Meany, Jr. ... District Manager

PITTSBURGH OFFICE
Law & Finance Building, 429 Fourth Ave.
Room 1505, GRant 1-5847
Ernest S. Holzworth .... District Manager

DETROIT OFFICE
204 Washington Square Building
Royal Oak, Mich., LIncoln 7-9455
John D. Yoder ..... District Manager

LOS ANGELES OFFICE
650 South Grand Avenue, MAdison 2-0722
George O. Ruppert .... District Manager

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-1910
E. S. Klappenbach .... Eastern Manager
Harry B. Bullen ..... Representative

CHICAGO OFFICE
105 West Madison Street
Phone CEntral 6-2537
David T. Kenney ..... District Manager
Karel Wegkamp ..... District Manager

HOUSTON OFFICE
802 American Investors Building
CApitol 4-7726
John M. Spears .... Gulf Coast Manager

DALLAS OFFICE
1238 Mercantile Building
Riverside 8-3074
Pren G. Hollingsworth .... Representative

ENGLAND
101 Carrington House
6 Hertford Street
London W. 1
Phone GRosvenor 1289
Kenneth B. Barnes V.P., E. Hemis, Rep.

Subscription rates to the petroleum industry United States and foreign, 1 year, $5.00; 2 years $8.00; 3 years, $10.00. Single copies $1.00. Back copies when over a year old, $2.00.

Member
Audit Bureau of Circulations
Associated Business Publications

They Say—

Leadership lesson

Dear Sir:

It has always been amazing to me, as a student of the oil industry and an investor and stockbroker, that the "leaders" of the industry could make statements to the press without regard for the light in which they present the industry, without regard for their stockholders' interests, and without a concrete plan of action.

The pictures painted are almost always black and no effort is really made to present the industry in a favorable light.

It was, therefore, particularly pleasant to read the statement of K. S. Adams, chairman of Phillips Petroleum, wherein Mr. Adams depicts the oil industry as one with a normal amount of business problems but with a reasonably bright future. Of equal importance, he says what Phillips intends to do about these problems.

The entire oil industry should take a lesson from Mr. Adams in public relations and leadership.

Bernard Feshbach
Irving Lundborg & Co.

Changes might be needed

"What about the role of administrative agencies generally? The entire field of administrative law and of government regulation may require a searching reexamination of some of the premises on which we have based our conclusions.

"There have been many recent suggestions as to how coordinated and effective policy determination, planning, speed or processing, and fairness of adjudication might better be achieved. There is much in these suggestions that merits study.

"Administrative law must not in the years ahead develop blindly and haphazardly. In fashioning new administrative policies, we must recognize that each agency has different functions and purposes.

"In formulating modifications we must not ignore the lessons our experience of the last 50 years has so painfully taught us. Neither should our attitude be warped or distorted by old doctrines which ignore new social needs.

"As you know, some regulatory agencies sprang into being to meet what was felt were inadequacies in free market operations. If such an

SHORT COMPACT RUGGED

GUIBERSON'S SHORTY TENSION PACKER *for* WATER FLOODING

Here is a rugged, low-cost retrievable tension packer that's short and easy to handle. Uncomplicated and functional in design, it's easy to set, space out and spot . . tension set by pulling on tubing string. And Guiberson's shorty tension packer is priced to cut your costs . . designed especially for water flood injection wells.

SAFETY JOINT COUPLING: right hand release 8 round thread for added safety.
ANCHOR CAGE: one piece malleable iron.
MANDREL: full opening heavy one piece seamless steel tubing.
LATCH: dependable J-slot mechanism, shock-absorber equipped, independent of safety joint operation.
FRICTION PADS: heat-treated pearlitic malleable iron.
SLIPS: heat-treated alloy steel.
HEADS: drillable cast iron.
RUBBER: specially compounded to withstand the most rugged oilfield use at high pressures and temperatures—built-in ability to return to original shape.
THIMBLE: drillable cast iron.
SAFETY RELEASE NUT: predetermined tension load at packer strips out, leaving safety nut, thimble, rubber and head—all drillable.

Sold by Oil Field Supply Stores Everywhere

THE GUIBERSON CORPORATION

ESTABLISHED 1919

DALLAS, TEXAS U. S. A.

Only Grinnell has a complete line of pipe

With 8 . . . 9 . . . even 10 inches of thermal movement not a bit unusual in today's high temperature piping systems, complete support for piping in all positions of travel is vital.

SAFETY OF ENTIRE SYSTEM AT STAKE

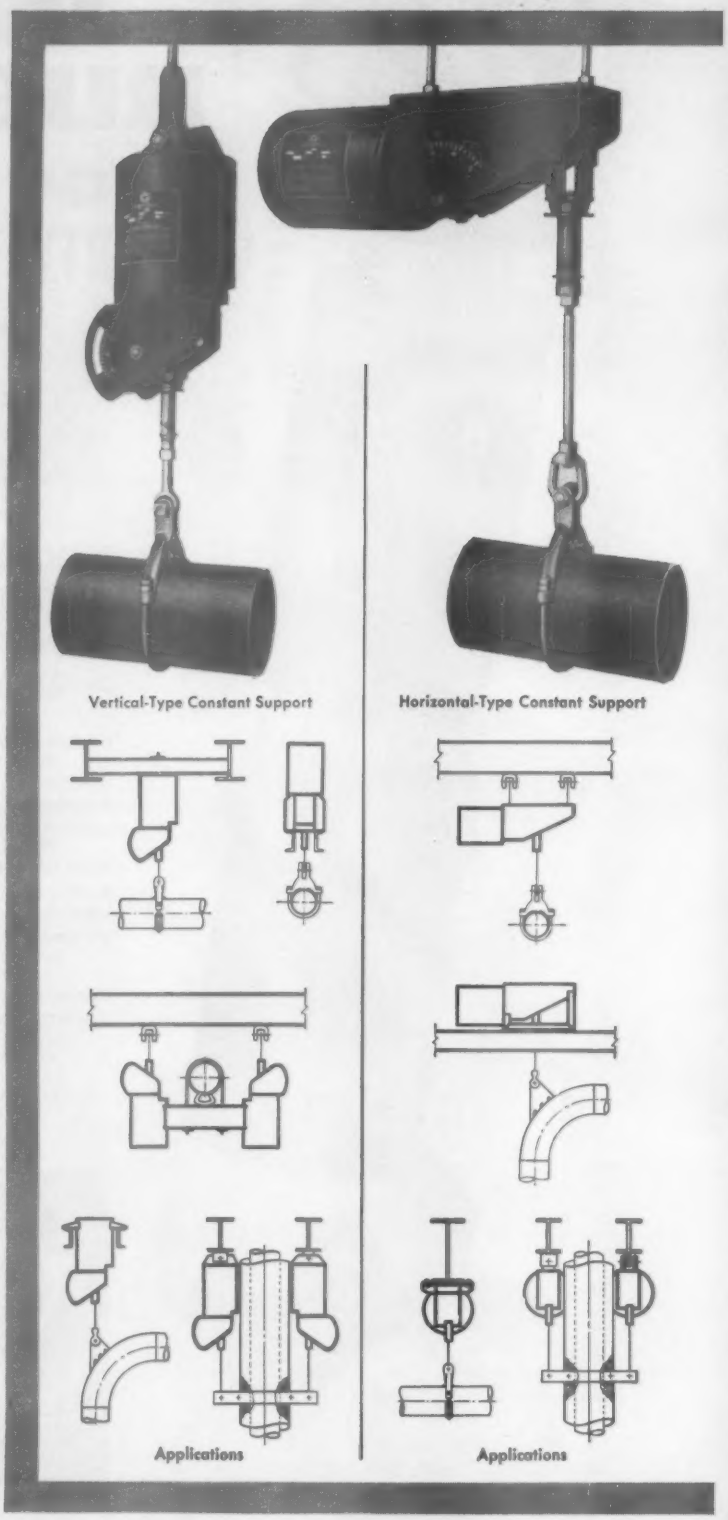
Helical coil springs are widely used to provide for thermal expansion. But the design or selection of flexible supports often is haphazard. Unless careful study is given to the design and choice of spring supports, the transfer of weight from one hanger to another, or from hanger to terminal points, can endanger the safety factor of the entire system.

MATHEMATICALLY PERFECT GRINNELL CONSTANT SUPPORTS

Grinnell Constant Supports are the result of a century of experience in the industrial piping field. A patented geometric design, exclusive with Grinnell Constant Supports, assures mathematically perfect load support throughout all positions of travel. There is also a full 70 percentage points of adjustability built into them. No less than 10 percent of this adjustability is allowed either side of calibration for plus or minus change in load. Field readjustments are easily made by turning a single load adjustment bolt. These hangers are designed to provide uniform supporting force equal to the pipe load throughout the travel range — and should be used at selected points on critical lines, as for example at turbine connections.

Available in 11 Different Types

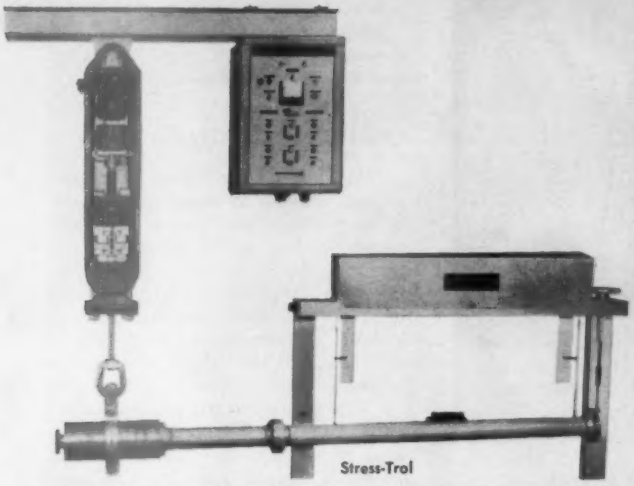
Grinnell Constant Supports are available in eleven types for a complete choice of mounting positions; above, between, or below structural steel. This choice includes both vertical and horizontal design to fit compactly into available headroom space. Even with this wide choice, Grinnell Constant Support Hangers provide mathematically perfect support through *all* ranges of travel, regardless of field adjustments.



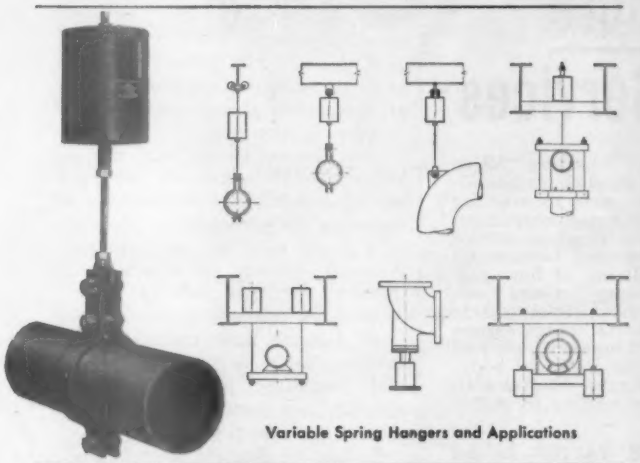
GRINNELL

AMERICA'S No. 1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

hangers to provide for thermal expansion



Stress-Trol



Variable Spring Hangers and Applications

Vibration Control and Sway Brace

Light-Duty Hangers

GRINNELL STRESS-TROL* FOR POSITION AND/OR LOAD CONTROL

Keeping the footage of high pressure-high temperature fabricated piping to a minimum has become important because of high piping costs. This can be accomplished by reducing the length of long expansion bends, but providing support for shorter, less flexible lengths of piping presents a new problem. Grinnell Stress-Trol, a motor operated device, solves this problem. It provides:

Position Control — that minimizes stresses in piping and reactions on connected equipment.

Load Control — that is constant support with unlimited load and travel capacities.

GRINNELL VARIABLE SPRING HANGERS

When pipe lines are subject to relatively small vertical movement, and do not require a constant support type hanger, Grinnell Variable Spring Hangers are available. The maximum variation in supporting force for standard spring models per ½ inch deflection is 10% of rated capacity. Grinnell offers these hangers in 21 sizes — in short, standard and double spring models, plus a special corrosion-resistant model. There are 7 different methods of attachment.

GRINNELL VIBRATION CONTROL AND SWAY BRACE

When necessary to prevent undesirable movement in lines, Grinnell Vibration Controls and Sway Braces of the energy storing and instant-acting counter force type are recommended. They dampen vibration, oppose pipe sway and absorb shock.

GRINNELL LIGHT-DUTY SPRING HANGERS

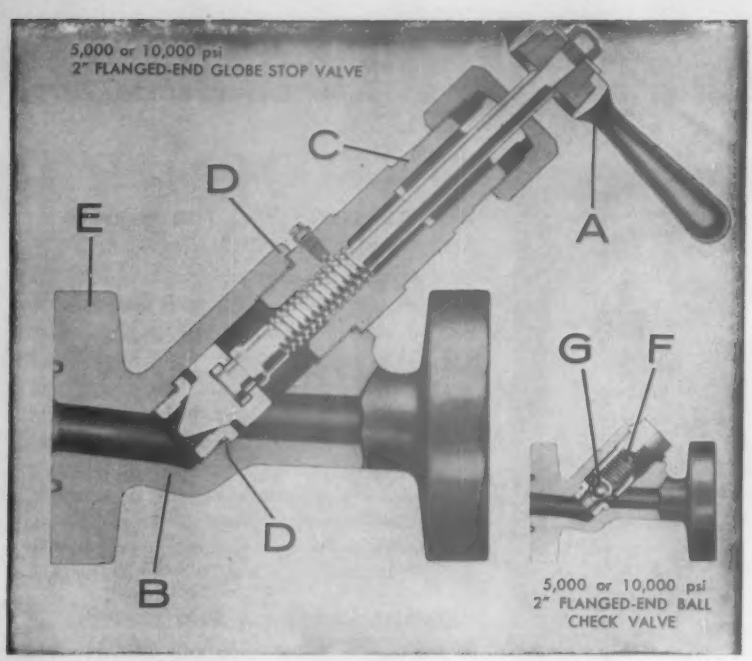
Finally, simple and inexpensive adjustable light-duty spring hangers often are all that's required to support piping safely. Grinnell has a complete line of light-duty hangers. They are designed for easy installation and quick, accurate alignment of piping.

Whatever your pipe suspension needs, Grinnell can supply them. Grinnell Company, 260 West Exchange Street, Providence 1, Rhode Island.

*Patents Applied For

GRINNELL

BRANCH WAREHOUSES AND DISTRIBUTORS IN PRINCIPAL CITIES



New Edward High-pressure Valves for Petroleum Services

New high-pressure, *flanged-end* valves from Edward are designed to give you longer, more dependable service for many petroleum industry applications requiring highest quality in forged steel valves: high pressure heaters, treaters and separators, high-pressure vessel blow-down; headers and flow lines; bypass lines; unloading in compressor stations; blow-out preventer manifolds; throttling services; and many other similar petroleum industry applications.

NEW GLOBE STOP VALVES—There are two new Edward flanged-end, globe stop valves: one for pressures to 5,000 lb WOG at 300F (10,000 psi test); and one for pressure to 10,000 lb WOG at 300F (15,000 psi test). Both valves have the exclusive cross-arm style Impactor handle* (A) that makes closing against high pressure much easier, eliminates need for "cheaters." Valve body (B) is drop forged of chromium-molybdenum alloy steel to exacting requirements for maximum ruggedness and long life under toughest service conditions. The inclined bonnet (C) facilitates streamlining of flow passages, reduces pressure drop and wear-producing turbulence. Metal gaskets (D) and buna-N "O" rings assure tight, leak-proof fit between body and bonnet and between seat and body. Flanges (E) are forged integral with body and faced according to A.P.I. Standard 6B.

New globe stop valve Figs. 5158 and 9158

New ball check valve Figs. 5160 and 9160

NEW BALL CHECK VALVES—In the same pressure classes as the new stop valves, are two new forged-steel, ball check valves. These new check valves have the same general construction plus stainless steel spring (F) and 16% chromium stainless steel ball disk (G) for tight seating. Seat and ball disk are replaceable.

To get the complete story, plus ratings and dimensions, on new Edward flanged-end valves, write for Bulletin 584. Edward builds a complete line of cast and forged steel valves for pressures to 10,000 lbs, with flanged, screwed, socket, or butt welding ends. For additional information, see your favorite distributor, or write Edward Valves, Inc., 1212 West 145th Street, East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company. *T.M. Reg. U.S. Pat. Off.

EDWARD STEEL VALVES
another fine product by
ROCKWELL

assumption were valid when the agencies were created, is it true today?

"Or, to the extent that free markets can work to serve the public interest, would it be better to let market pressures—rather than governmental regulation—mold some of these economic decisions? There is room, I believe, for this sort of inquiry."

William P. Rogers, U. S. Attorney General, in a speech to the Securities and Exchange Commission.

Coal calls for Uncle Sam

"We have been faced with the serious problem of unfair competition in the fuels market. One of the worst phases of this unfair competition is the cut throat dumping of natural gas into traditional coal industrial markets . . . This dumping of interruptible gas presents one of the greatest threats to the future of the coal industry.

"The efforts of the coal industry, while strenuous, have thus far been unable to halt the steady, ruthless invasion of gas into markets now being economically and efficiently served by coal.

"Unless the FPC takes firm action to set the natural gas industry's house in order, the present situation will continue to deteriorate.

"We can be assured that the gas industry, in its search for the quick and easy dollar, has no intention of beginning the job itself.

"For coal men, the job is clear-cut. We must intensify our efforts on all fronts to meet this challenge.

"A public relations program can inform, educate, and create a more healthy climate in which to market coal. Legislative and administrative activities can curb inequitable competitive opportunities."

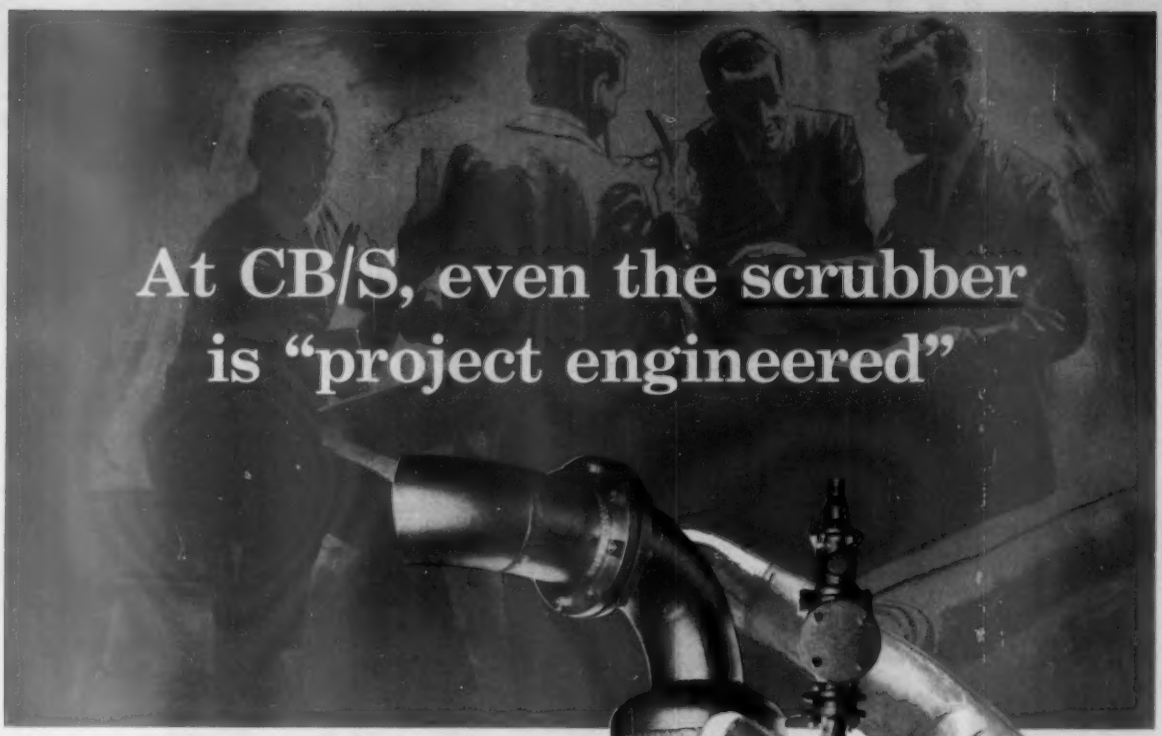
William W. Bayfield, executive vice president, American Coal Sales Association, in a speech to the Chicago Coal Shippers Association.

Staggering tax total

"How much is $7,000,000,000? It is about $155 for every wage earner in the United States. It is more than the total federal taxes collected annually before World War II. It is a third of the value of all the gold in the U. S. treasury.

"Also, it is the approximate amount the oil industry funnels into treasuries of the federal, state, and local governments each year.

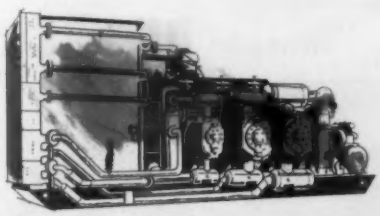
"Among the many taxes collected and paid annually by oil companies are income and franchise taxes, production taxes, gallonage taxes on manufacture and distribution of gas-



At CB/S, even the scrubber is "project engineered"

The *scrubber* may look conventional . . . but it's "custom-designed" and built for each installation by CB/S. Engineers carefully examine a gas analysis of the field to develop optimum extraction efficiency and high overload capacity . . . test every weld to insure strength exceeding code requirements . . . evaluate hundreds of field reports to provide the industry's most dependable dump trap and auxiliary equipment.

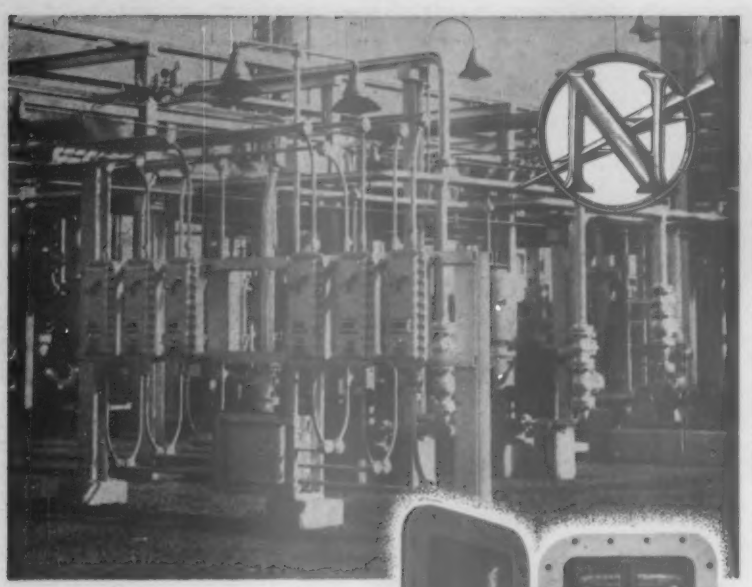
A lot of fuss about a scrubber? Perhaps . . . but this painstaking attention to detail pays off. That's why CB/S Packaged Compressors are more dependable . . . why they require less field maintenance. Building better packaged compressors is our *only* business.



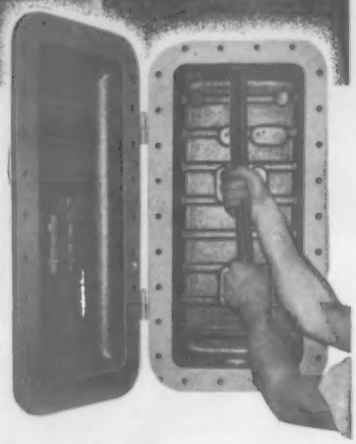
CB/S Packaged Compressors are available in ratings from 100 to 1100 horsepower . . . unitized compressors to 5000 horsepower.

CB/S C-B SOUTHERN, INC., P. O. BOX 19267, HOUSTON 24, TEXAS

A subsidiary of The Cooper-Bessemer Corporation



Field installation men like this important **NELSON** *feature . . .*



Designed and built with the field man in mind, Nelson starters arrive at the job site fully assembled and wired. The entire enclosure is made available for cable pulling by removing four screws and lifting out the pan-mounted assembly.

Nelson selects and uses only those components recognized for trouble-free performance, thus reducing maintenance to a minimum.

Look in the yellow pages of your phone book for the name of your Nelson representatives, or write the factory for information.

a major source of electrical control equipment for industry

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

oline and oils, sales and use taxes, payroll taxes, property taxes and others.

"They all add up to the staggering figure of $7,000,000,000."

M. J. Kennedy, New Orleans area tax representative, Shell Oil Co., in an article in the October issue of Shell News, company magazine.

Rx for road distress

"After studying the performance records of modern heavy-duty asphalt pavements and evaluating the data furnished by recent critical pavement tests, Asphalt Institute engineers have proposed 'advanced design criteria' for asphalt pavements.

"Virtually all asphalt pavement distress can be traced directly to three basic design failures: Inadequate thickness of the asphalt section, faulty drainage, insufficient compaction in one or all courses.

"The Institute is urging adoption of asphalt bases and a minimum thickness of 4 inches in the binder and surfaces courses.

"Improved full-width drainage of four, six, and eight-lane divided highways (with depressed median drains) will relieve hydrostatic pressure, reduce the danger of frost damage, and minimize the erosion of foundation materials.

"Traffic imposed by today's heavier vehicles has demonstrated the need for more intensive compaction during construction. These tighter compaction specifications should apply to all courses, from the foundation to the asphalt concrete wearing course."

Article in the October Asphalt Institute Quarterly.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR OF EVENTS

NOVEMBER

2-4 Geological Society of America, annual meeting, Penn-Sheraton Hotel, Pittsburgh, Pa.

4-6 Rocky Mountain Oil and Gas Association, fourteenth annual convention, Brown Palace Tower, Denver.

4-6 Institute of Radio Engineers, national automatic control conference, Sheraton Hotel, Dallas.

9-10 National Academy of Sciences-National Research Conference, first international symposium on fire research, National Academy of Sciences, Washington.

engine power
BY CATERPILLAR

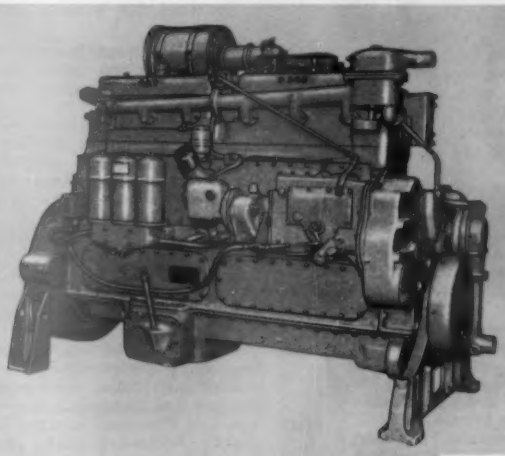
The new D342 Spark-Ignition Engine... lowest cost-per-horsepower gas engine

The new Caterpillar D342 Spark-Ignition Engine has the lowest cost per horsepower of any gas-operated engine you can choose.

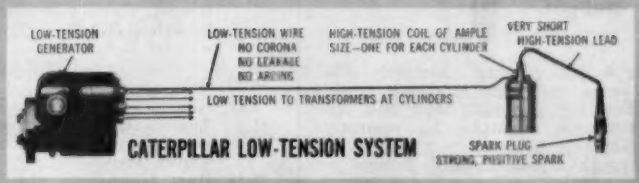
You can select either the 7.5:1 compression ratio —for butane, propane or field gases—or the maximum efficiency 10:1 compression ratio engine for methane-type gas operation. And you can switch to diesel operation simply by changing pistons and fuel systems.

This is another dependable power-where-you-need-it Caterpillar Engine for oilfield use. Specify Cat power or see your Caterpillar Dealer who will demonstrate the ways Caterpillar will do more things and do them better for you.

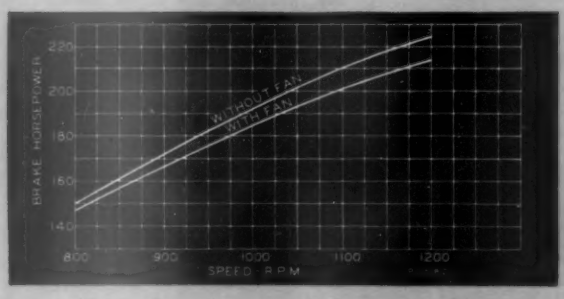
Engine Division, Caterpillar Tractor Co., Peoria, Illinois, U. S. A. Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.



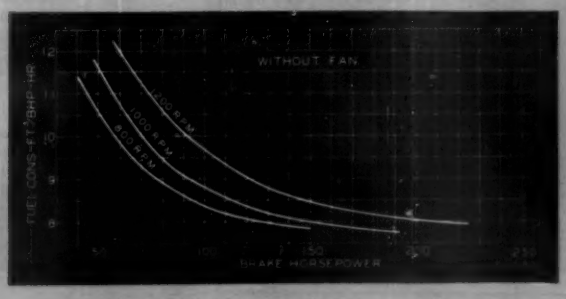
With the 7.5:1 compression ratio, the D342 Spark-Ignition Engine produces 200 BHP at 1200 RPM, without fan. At the same RPM without fan, the 10:1 compression ratio produces 225 BHP.



The D342 Spark-Ignition Engine has this safe, positive ignition system



Highest horsepower per dollar you can buy 10:1 compression ratio



Curves illustrate low fuel consumption 10:1 compression ratio

H2OIL
OIL TREATING SYSTEMS

"GAS GARD"

Your best insurance against loss of life or property wherever lease gas is used! Incoming gas is filtered **before** use. Three separate chambers within "GAS GARD" do it. As fluids build up in lower chamber, stainless steel float rises and shuts off gas until fluid is drained away manually. A size for any application.

IMMEDIATE DELIVERY

4" x 30" x 125 PSI

$75.70

F.O.B. TULSA

"GAGE IT"

THE Gauger's Delight

For determining oil-water, BS-water interface in stock tank. Fits any standard tape line. No batteries. Simple to operate. Nothing to wear out. Shipping weight approximately 2 lbs.

IMMEDIATE DELIVERY

$42.50

(Without Tape Line)

F.O.B. TULSA

Write for Literature

THE HOIL COMPANY

Oil Treating Systems

TULSA, OKLAHOMA

Or Thru Your

CONTINENTAL-EMSCO STORE

9-11 American Petroleum Institute, thirty-ninth annual meeting, Conrad Hilton, Palmer House, and Congress hotels, Chicago.

9-12 Society of Exploration Geophysicists, twenty-ninth annual meeting, Biltmore Hotel, Los Angeles.

11-13 Gulf Coast Association of Geological Societies, ninth annual meeting, Shamrock Hilton Hotel, Houston.

12-13 American Association of Petroleum Geologists, Society of Exploration Geophysicists, Society of Economic Paleontologists and Mineralogists, Pacific section, thirty-sixth annual joint meeting, Biltmore Hotel, Los Angeles.

14-15 Gulf Coast Association of Geological Societies and Gulf Coast section, Society of Economic Paleontologists and Mineralogists, joint annual field trip, Galveston, Tex., to Cameron, La.

16-20 Fifth International Automation Congress and Exposition, New York Trade Show building, New York.

17-18 Natural Gas Pipe Line Institute, new Seward County Courthouse, Liberal, Kans.

19 West Central Texas Oil and Gas Association, annual meeting, Hotel Windsor, Abilene, Tex.

20 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

20 Appalachian Geological Society, technical meeting, Charleston, W. Va.

22-29 Third Venezuelan Geological Congress, sponsored by Venezuelan Society of Geologists and Venezuelan Ministry of Mines and Hydrocarbons, Caracas.

29-Dec. 4 American Society of Mechanical Engineers, annual meeting, Chalfonte Haddon Hall, Atlantic City, N. J.

DECEMBER

1-2 Western Petroleum Refiners Association, second computer conference, Hotel Tulsa, Tulsa.

3-5 Interstate Oil Compact Commission, annual meeting, Sheraton Hotel, Philadelphia.

3-5 American Chemical Society, southwest regional meeting, Baton Rouge, La.

6-9 American Institute of Chemical Engineers, annual meeting, Sheraton Palace Hotel, San Francisco.

11-15 Society of Automotive Engineers, meeting, Sheraton-Cadillac and Statler hotels, Detroit.

JANUARY

22 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

25-28 Plant Maintenance and Engineering Show, produced by Clapp & Poliak, Inc., Convention Hall, Philadelphia.

31-Feb. 3 Pipe Line Contractors Association, annual meeting, Ambassador Hotel, Los Angeles.

FEBRUARY

1-5 Instrument Society of America, instrument-automation conference and exhibit, Houston Coliseum, Houston.

8 Alberta Division of Canadian Petroleum Association, annual meeting, Hotel Palliser, Calgary.

8-10 American Association of Petroleum Geologists, Rocky Mountain section annual meeting, Billings, Mont.

14-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Statler-Hilton and McAlpin hotels, New York.

21-24 American Institute of Chemical Engineers, meeting, Biltmore Hotel, Atlanta.

26 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

26 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.

MARCH

2-4 American Petroleum Institute, Division of Production, southwestern district meeting, Statler-Hilton Hotel, Dallas.

7 Canadian Petroleum Association, annual general meeting, Hotel Palliser, Calgary.

14-18 National Association of Corrosion Engineers, sixteenth annual meeting, Memorial Auditorium, Dallas.

16-18 American Petroleum Institute, Division of Production, southern district meeting, Hilton Hotel, San Antonio.

18 Natural Gasoline Association of America, Oklahoma regional meeting, Biltmore Hotel, Oklahoma City.

21-23 Midwest Gas Association, annual meeting, Hotel St. Paul, St. Paul.

24-25 New England Gas Association, annual meeting, Hotel Statler-Hilton, Boston.

28-30 Western Petroleum Refiners Association forty-eighth annual meeting, Hilton Hotel, San Antonio, Tex.

30-Apr. 1 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Broadview Hotel, Wichita.

APRIL

3-8 Engineers Joint Council, sixth nuclear congress, New York.

4-7 Oil Heat Institute of America, annual convention, Park - Sheraton Hotel, New York.

4-7 National oil heat and air-conditioning exposition, Coliseum, New York.

5-7 Instrument Society of America, national chemical and petroleum instrumentation symposium, Rochester, N. Y.

19-21 University of Oklahoma, College of Engineering, southwestern gas measurement short course, north campus, University of Oklahoma, Norman.

20-22 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone, Henning, and Townsend hotels, Casper, Wyo.

20-22 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.

24-26 Independent Petroleum Association of America, midyear meeting, Denver Hilton Hotel, Denver.

25-27 Southern Gas Association, convention, Buccaneer and Galvez hotels, Galveston.

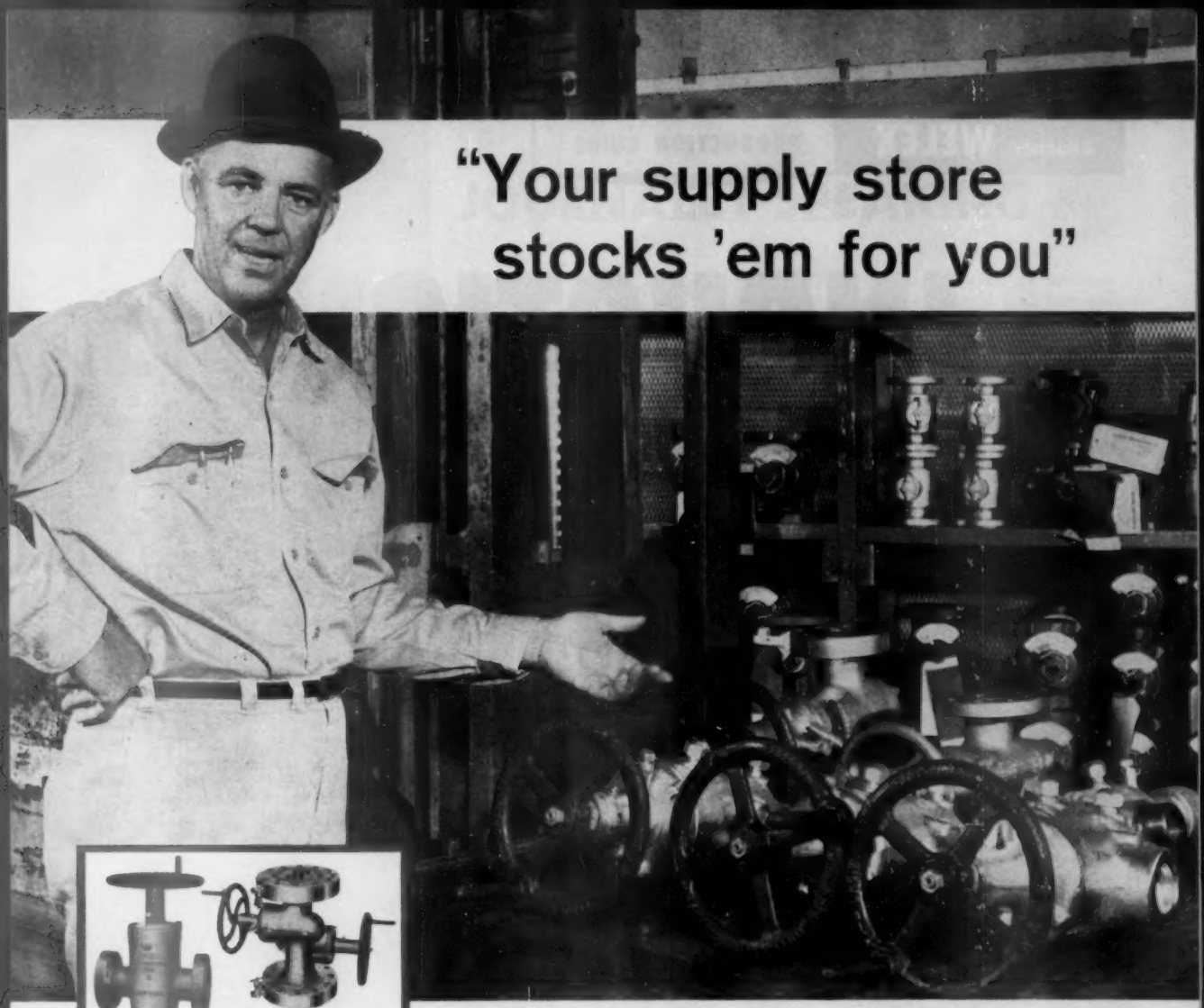
25-28 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, annual meeting, Chalfonte - Haddon Hall, Atlantic City, N. J.

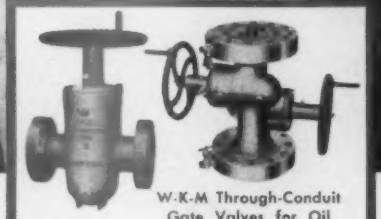
25-29 American Welding Society, annual meeting and welding exposition, Los Angeles.

27-29 Natural Gasoline Association of America, annual convention, Rice Hotel, Houston.

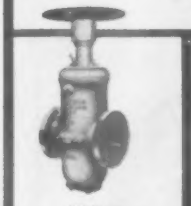
28-29 American Petroleum Institute, Division of Transportation, pipeline conference, Mayo Hotel, Tulsa.

"Your supply store stocks 'em for you"





W-K-M Through-Conduit Gate Valves for Oil Field Service Catalog 200



W-K-M Through-Conduit Gate Valves (ASA) Catalog 300

W-K-M's Pressure Sealing Gate Valves (ASA) Catalog 1200

ACF Lubricated Plug Valves (Semi-Steel) Catalog 400 (Steel) Catalog 1100

ACF Non-lubricated Ball Valves Catalog 1000

W-K-M® and ACF® Valves

Whatever your valve requirements, your nearby oil field supplier can fill them. He stocks all standard models and sizes of W-K-M and ACF valves for production, pipeline and general service. He can obtain W-K-M technical assistance and expedite special orders for you.

Next time — and every time — you need valves, order W-K-M and ACF from your supply store. You'll get the best performance you've ever had.

PRODUCTS OF W-K-M's *Creative Engineering*

WRITE FOR CATALOGS LISTED

W-K-M

DIVISION OF ACF INDUSTRIES INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

5915 R

Another **WELEX** **PRODUCTION GUIDE**

INDUCTION ELECTRIC LOG

BETTER THREE WAYS

1. **Better thin bed response.**
2. **Deeper Investigation.**
3. **More detail.**

You get all three field tested advantages with the new Welex 5-coil Induction-Electric Log.

WELEX, INC.

ORIGINATORS OF Welex JET PERFORATING

General Offices:
1400 East Berry, Fort Worth, Texas
Division offices in
Denver, Houston, Los Angeles, Midland,
New Orleans, Tulsa and Wichita.
District offices in every major oil center.
Subsidiaries in
Canada and Venezuela.

the Journal said...

50 years ago

November 6, 1909

Prairie Oil & Gas Co., operating from Independence, Kans., decides against Oklahoma domestication. Standard Oil Co. to organize separate company to lay pipeline from Oklahoma oil fields to connect at Louisiana border with line Louisiana Standard is building to its new Baton Rouge refinery, now under construction.

Eyes of Oklahoma oil men turn to new Hamilton switch (Preston) field, near Okmulgee, as three more wells, first since field's discovery last August, come in with big initial flows. Flow of discovery well holds up at more than 400 bbl. per day.

25 years ago

November 1, 1934

First major water flood for Oklahoma proposed by Wiser Oil Co. Experimental operations, following methods used with success in Bradford, Pa., area, to be conducted on certain old stripper properties in Nowata County, and at Glen Pool, in Creek County. Results expected to mean much to operators owning thousands of wells in Nowata, Osage, Washington, Tulsa, Creek and Okmulgee counties.

Maiden run of Union Pacific's new streamlined, diesel-fueled train cuts 14 hours and 32 minutes from previous record train time from Los Angeles to New York, and effects major economies in fuel costs. Performance believed to mark new era in transportation, important both of railroaders and oil industry.

10 years ago

November 3, 1949

Guards block roads into booming Placerita field to prevent entrance of additional drilling rigs. Drastic action follows threat of more closely spaced wells after invalidation of California law prohibiting drilling on land parcels of less than 1 acre. One small area subdivided into 1,000 parcels.

Britain reveals program to spend more than $500,000,000 during ensuing year on expansion of its oil industry at home and abroad. Expenditures on plants to total more than $100,000,000.

Maysville gasoline plant, heart of three-unit system in Garvin County, Oklahoma, and one of world's most modern and unique operations, opens. Multiple-field project, designed to process 85,000 M.c.f. daily and recover 300,000 gal. of liquid products, is joint operation of Warren Petroleum Co., Carter Oil Co., Cities Service Oil Co., The Texas Co., and J. E. Crosbie, Inc.

JOURNALLY SPEAKING

Who's in Charge Here?

"IF THE MAJORS would stop firing vice presidents long enough to give some serious thought to the condition of the oil business as a whole, we'd all have fewer problems."

It was no crackpot or sorehead speaking. He is the head of a small but active independent producing company, a man who does his full share in tackling industry problems through service on various industry committees.

"The so-called captains of industry are all preoccupied in trying to make a showing for their stockholders on how they're cutting costs by consolidating branch offices. They're penny-wise and dollar-foolish—saving a penny here when they could make a dollar there if they'd go after it. And then the rest of us maybe could make a couple of nickles, too.

"Everybody's so busy trying to save his own skin that nobody has time to look at the big picture or see where the industry is headed. Talk about industrial statesmanship! We've got less of it today than we ever had, but now's just the time we need it most."

This man was thinking primarily of the need for high-level thought and leadership on such problems as drafting an acceptable natural-gas bill, ending gasoline-price wars, holding down refinery runs, spreading the crude market more equitably, reducing products stocks, and carrying excess crude-producing capacity.

But he is not alone in his gripe about the "inward-lookingness" and absence of progressive leadership that seem to characterize the oil industry today. Everywhere we go we hear half-humorous, half-snide cracks, from both independents and small and medium-fry executives of the majors, to the effect that the big companies are devoting so much attention to tightening their own belts that they don't know what's going on in the oil business generally.

One man kept us on a street corner for 30 minutes listening to a lecture on how refiners could make a lot of money if they would just look beyond the ends of their noses.

"What the big refiners ought to do," was the gist of his scheme, "is to buy up distress gasoline and other products whenever and wherever it's available at a low price. They'd find they can buy it cheaper than they can make it, if they would only get over the notion that the only way they can keep their costs down is to run their own plants to capacity.

"There's not a whole lot of distress product being offered, but quite a few refineries often get a little long on supply, and when they try to move some at less than another man's cost, that other fellow ought to grab it in a hurry and make himself some money.

"Furthermore, just one or two cargo lots of gasoline offered at a distress price scares everybody into thinking the whole market is falling. So if some big refiner would buy these quick he would not only make a profit on the transaction but also would firm up the tone of the whole market."

Much the same thought was voiced by another oil man who teed off against what he called the majors' obsession for "balance."

"Nowadays," he said, "it seems to be the fashion for an integrated company to refine just the crude from its own wells without buying or selling a barrel, refine everything it sells, and sell all its products through its own outlets.

"That's silly. Lots of times they could show a better profit by buying some crude or product from somebody else, or marketing some of their material through others. And some of the rest of us might make a little on such deals, too."

Of course it's easy to criticize how another fellow runs his business. But there is quite a ground swell of dissatisfaction throughout the industry about bosses who don't boss, leaders who don't lead, and executives who just shuffle papers. They may be doing all right by their stockholders but, in the opinion of the man in the street, they ignore the rest of the industry and their company's relationship to it.

We must report a widespread feeling that many of the industry's current problems could be eliminated by some broad and forward thinking by men whose positions should make them the industry's statesmen.

—Henry D. Ralph.

NEW FROM DODGE FOR 1960

The thriftiest trucks, in the widest tonnage range, Dodge has ever built . . . including totally new cab-forward models with diesel or gasoline engines.

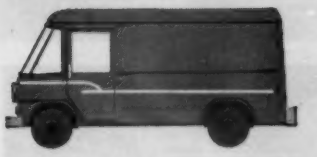
Name your job. There's a Dodge truck to do it. For Dodge has never had a line-up as great as this new 1960 truck platoon. Spirited panels and pick-ups that deliver up to 200 horsepower. Rugged stakes with up to 19,500 lbs. G.V.W. Husky 4-wheel-drive models with wheelbases from 108″ to 174″. All these and more make Dodge your smartest choice for efficient, low-cost hauling. And in the heavyweight class, Dodge introduces a completely new line of cab-forward models, trucks engineered to put real muscle into your biggest jobs, trucks whose new Servi-Swing fenders open with a simple latch and allow you to walk right up to the engine! See your Dodge dealer. He'll be pleased to give you the full Dodge truck story for 1960.

DEPEND ON DODGE TO SAVE YOU MONEY IN TRUCKS

A PRODUCT OF CHRYSLER CORPORATION

"JOB-RATED" FROM 4,250 LBS. G.V.W. TO 76,800 LBS. G.C.W.

SWEPTLINE pick-ups head their class in looks; lead in load space, power. 4-wheel-drive optional.



FORWARD-CONTROL chassis put famous Dodge dependability under the body of your choice.

VAN and other special bodies are easily accommodated by most 1960 Dodge trucks.

TRACTOR models with compact new 89¼" BBC pull longer trailers, bigger legal payloads.

STAKE bodies from 7½′ to 14′ are built by Dodge on models to 19,500 lbs. G.V.W.

TANDEM units provide top hauling strength for dump and other extra-rugged operations.

DEPENDABLE *BAKER* CEMENT RETAINER

PRODUCT NO. 400

There is nothing "just as good" as a Baker Cement Retainer for placing cement, plastic, acid or other fluids through tubing or drill pipe—at the most effective point behind casing or liner—around the shoe, or in open hole below the shoe. Dependable pack-off, known drillability, and the presence of a back-pressure valve which automatically holds squeeze pressure against the formation, bring peace of mind on all squeeze jobs.

SET POSITIVELY— DRILL UP EASILY

Baker Cement Retainers are set accurately and positively on tubing, drill pipe, or a wire line. Opposed slips prevent movement in either direction, and the resilient packing element is backed up by metallic rings to prevent packing element flow under the highest pressure differentials. Made of drillable CAST IRON or extremely drillable MAGNESIUM for any application or well condition.

Baker CEMENT RETAINER SERVICE is available anywhere, anytime. Just call the Baker Trained Serviceman in your area.

BAKER
OIL TOOLS, INC.
HOUSTON · LOS ANGELES · NEW YORK

Suspicion is the biggest obstacle in the gas mess

More than 5 years after the Supreme Court told the Federal Power Commission to determine the reasonableness of gas producers' prices there is:

. . . Universal agreement that no formula or set of standards has been found acceptable and that the gas industry is in a state of confusion.

. . . Virtual agreement that the cost-of-service rate-base formula used for gas pipelines is not readily suited to producers and can be applied to them, if at all, only with some modifications.

. . . Little agreement on the nature and extent of the alterations needed, or what new approach might be tried.

. . . Less agreement on whether the modifications should be made by Congress, by the courts, or by FPC.

. . . No agreement on how to go about getting more agreement in those areas where there is little at present.

PARADOXICAL as it may appear, it seems to us that the best place for action now is where there is no agreement at all.

The deadlock of distrust, suspicion, and hate among the interests concerned must be broken before there can be any progress toward a solution.

Producers are still thinking in terms of dictating their own bill and bulling it through Congress at a propitious time.

FPC is feebly groping toward new procedures and experiments which might help to a degree.

Gas distributors seem to prefer court-made law and to be dug in for extensive and bitter litigation.

Pipelines, caught uncomfortably in the middle but in best position to know the problems of all parties, are strangely inarticulate.

The only way these groups will talk to each other is through secret emissaries, carrying flags of truce to neutral grounds and disclaiming any authority to speak for anybody, including themselves.

The time has come for everyone to put his cards on the table in an open peace conference. Scores of individuals have outlined possible solutions, and these should be discussed without secrecy or suspicion.

MOST IMPORTANT, the public should be a party to all conferences on ways to end the gas-price mess. And the public is officially represented by those agencies created to protect gas consumers—the FPC and the public-utility commissions of the several states.

These commissions now consider themselves the natural enemies of the industry, and the feeling is reciprocated.

But until the regulatory commissions accept—or at least understand—any new approach the three elements of the industry might agree on, hope for substantial progress will be largely futile.

How IPAA Sees Supply and Demand in 1960

(Thousands of barrels daily)

	1959			1960				
	*3rd Q.	4th Q.	Year	1st Q.	2nd Q.	3rd Q.	4th Q.	Year
Domestic Demand								
Gasoline	4,358	3,988	4,073	3,822	4,395	4,438	4,142	4,200
Kerosine	218	409	313	468	172	206	416	315
Distillate	1,180	2,205	1,837	2,708	1,392	1,251	2,292	1,911
Residual	1,173	1,625	1,537	1,800	1,353	1,224	1,626	1,500
Others	1,842	1,769	1,719	1,736	1,830	2,032	1,906	1,876
TOTAL	8,771	9,996	9,479	10,534	9,142	9,151	10,382	9,802
Exports								
Gasoline	66	63	62	52	61	65	62	60
Kerosine	1	3	2	2	2	2	2	2
Distillate	29	44	37	42	41	45	44	43
Residual	69	65	76	73	66	67	64	68
Others	75	71	71	68	72	72	71	70
TOTAL	240	246	248	237	242	251	243	243
Total Demand	9,011	10,242	9,727	10,771	9,384	9,402	10,625	10,045
Stock Change	+135	−618	−47	−550	+484	+478	−434	−5
New Supply Required	9,146	9,624	9,680	10,221	9,686	9,880	10,191	10,040
Closing Stocks (million bbl.)								
Gasoline	176	183	183	208	183	169	184	184
Kerosine	32	26	26	18	26	33	27	27
Distillate	174	141	141	82	118	168	136	136
Residual	59	49	49	42	46	53	47	47
Other Products and Natural-Gas Liquids	139	127	127	126	141	135	126	126
Crude	249	246	246	246	252	252	250	250
Total	829	772	772	722	766	810	770	770

*Estimate based on U. S. Bureau of Mines and API figures.

Domestic Demand to Rise 3.4% in '60

● IPAA figures a general business pickup next year will be enough to increase product demand by 323,000 bbl. daily over 1958. Total new supply required will average more than 10,000,000 bbl. daily for the first time.

A GENERALLY improved business picture will mean a 3.4% greater market in this country for the oil industry's products next year.

That's the conclusion of the supply-demand committe of the Independent Petroleum Association of America, presented last week at the association's annual meeting in Dallas.

The percentage gain is smaller than the 1950-58 average of 4.2%, but in volume—323,000 bbl. daily—it tops the 9-year average gain of 320,000 bbl. daily.

The committee saw these probabilities for 1960:

... **Domestic demand** of 9,802,000 bbl. daily.

... **A dip in exports** of 5,000 bbl. daily to an average of 243,000.

... **A resulting total** demand of 10,045,000 bbl. daily—and the first year in this country's history to see a yearly average above 10,000,000 bbl.

... **A better year** for producers. This is due to two factors: A level of imports much lower than existed during the first half of this year, and a better inventory outlook.

Imports this year, the IPAA group said, will average perhaps 2,200,000 bbl. daily due to a high first half.

Current quotas are about 1,600,000 bbl. daily. As for stocks, the committee estimated an average withdrawal of 47,000 bbl. daily this year. Next year it sees the need to draw them down only 5,000 bbl. daily.

With less of the market supplied by foreign crude and less oil taken from storage, the committee predicts U. S. production of crude oil and gas liquids will jump 6.8% to an average of 8,439,000 bbl. daily.

This is 534,000 bbl. daily more than its revised estimate of 7,905,000 bbl. daily for 1959.

The committee based its forecast on the assumption that import quotas will not be changed. Domestic production, it said, will vary up or down in response to any variation from the present level.

Reason for optimism . . . General business conditions will improve next year, even though the steel strike may affect the pace of activity, the committee said.

It estimated gross national product at $512 billion in 1960, up 6%, and forecast the Federal Reserve Board index at 159, also up 6%.

This rate of business activity, it concluded, should give the oil industry a 3.4% increase in domestic demand.

One straggler . . . The committee forecast increases for all products except residual fuel oil.

For this product it saw drop in demand of 2.4%, but it was hesitant to call it a drop. Members pointed out that during the first quarter of this year resid imports were unusually high. Much of this, however, was further processed and, they felt, should not have been counted as residual.

It is only because of the high first-quarter figure that the IPAA committee forecast is for a drop in 1960.

Here's how IPAA sees 1960 demand by products:

. . . **Gasoline:** 4,200,000 bbl. daily, up 3.1%.

. . . **Kerosine:** 315,000 bbl. daily, up 0.6%.

. . . **Distillate:** 1,911,000 bbl. daily, up 4.0%.

. . . **Residual:** 1,500,000 bbl. daily, down 2.4%.

. . . **Other products:** 1,876,000 bbl. daily, up 9.0%.

The committee changed its year-old forecast for 1959 only slightly.

At the meeting a year ago the committee predicted a 1959 domestic demand of 9,400,000 bbl. daily, an increase of 4.5% over 1958.

In reviewing this forecast last week, the committee said it now believes demand for 1959 will average 9,479,000 bbl. daily, making it a better year than it looked a year ago.

IPAA Names Hope to Top Post

. . . to succeed Gordon Simpson. Association also elects 17 vice presidents and names six to executive committee.

ALVIN C. HOPE, who became an independent operator in the year the Independent Petroleum Association was founded—30 years ago—last week was elected to be IPAA's thirteenth president.

The vigorous and active 64-year-old Hope will take over January 1 from Gordon Simpson, now completing a 2-year term.

The IPAA also named L. Dan Jones association counsel to succeed Russell B. Brown, who is retiring after 30 years with the group. It also elected six new members to the executive committee and 17 new vice presidents.

Hope, a San Antonio independent, has been a director and vice president of the association. He operates in central West Texas and South Texas but also has some holdings in the Rocky Mountains, and in Mississippi, Oklahoma, and Louisiana.

Alvin C. Hope
. . . to take over IPAA helm.

Varied background . . . He entered the oil business first with J. T. LaPrade, an independent, in 1919.

A year later he went to Mexico as a gager for Seaboard Oil Co, at its Tampico terminal. Soon he became chief clerk at the terminal, then chief clerk in the field, then field superintendent, and still later assistant superintendent in charge of land.

Hope returned to the States and in 1929 formed Rowan & Hope in a partnership with Jack Rowan that lasted until 1955.

He wasn't continuously active in oil, however. The military had its influence. In World War I he had been in the same officers training class that had made "90-day wonders" also out of Gen. E. O. Thompson and Gordon Simpson, whom he succeeds in the IPAA presidency.

He switched to the regular army during the war, but "disenchantment" with postwar army life led to his resignation and original entry into oil.

But when World War II came along, "I ran off to the army and left Jack Rowan running the business," he said. "In view of the sad plight of the industry at that time, Jack was the brave one," he adds.

Instead of the infantry this time, Hope became a major in ordnance. He later was sent to the China-Burma-India theater, where he won a bronze star for his handling of transportation.

After the war, he took an assignment in Peru as representative of Standard Oil Co. (N.J.) to work toward enactment of a new petroleum law. He returned to the domestic industry in 1948.

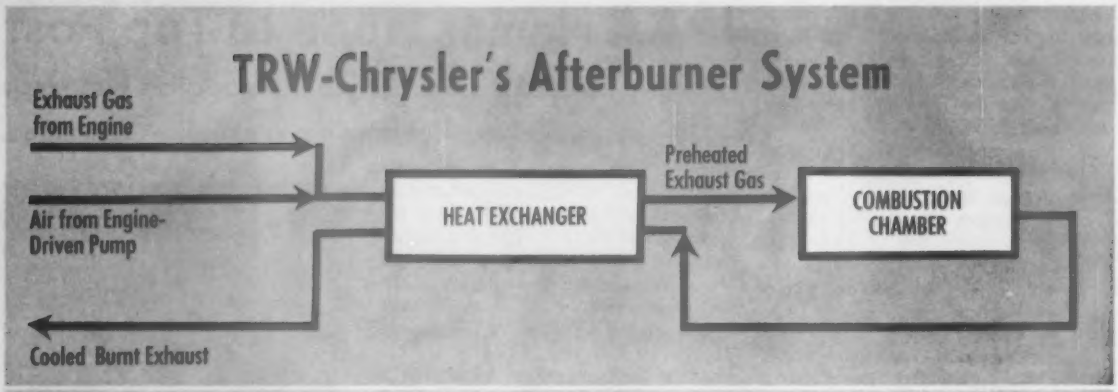
Two discoveries which Hope found most satisfying are Lake Trammel field and Rowan & Hope field. The first was drilled on acreage comprising the Sweetwater, Tex., city dump and sewage disposal grounds. The second was on the first land ever owned by his grandfather.

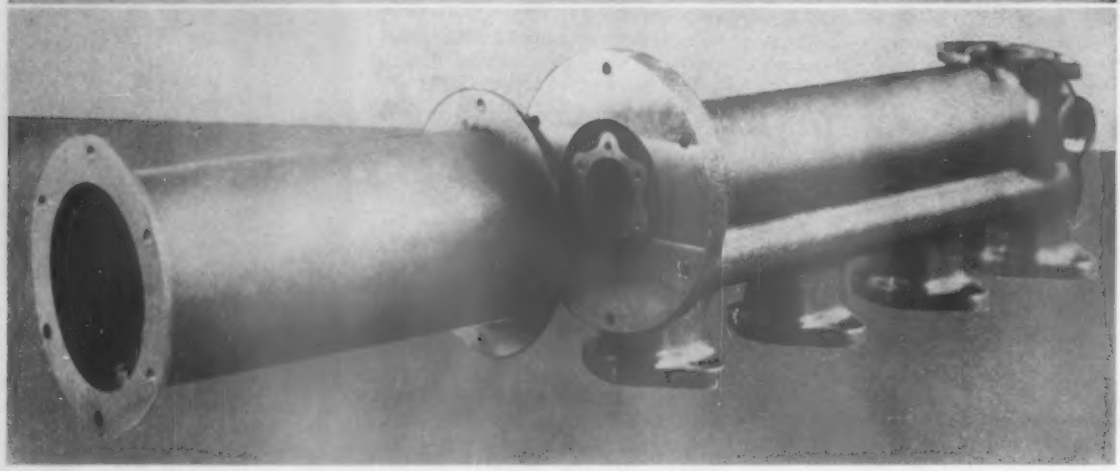
After the Rowan & Hope partnership was dissolved in 1955, Hope became a lone independent. He operates with his son, who is a geologist.

Other officers . . . The IPAA elected these men to its 25-man executive committee:

F. Allen Calvert, Jr., Tulsa; M. B. Chastain, Shreveport; Alden S. Donnelly, San Francisco; E. L. Green, Jr., Pampa; J. Paul Jones, Bradford, Pa.; and Robert J. Leonard, Roswell.

New vice presidents are: T. K. Jackson, Jr., Mobile; Chester F. Dolley, Los Angeles; E. M. Self, Mount Vernon; Elmo Holder, Evansville; Stanley Lambert, Owensboro; Jack O. McCall, New Orleans; John S. Callon, Natchez; David D. Haskins, Wellsville, N. Y.; Dean F. Smith, Bismarck; J. W. Straker, Zanesville; Edward A. Smith, Tulsa; W. M. Shoemaker, Bradford; George B. Cree, Jr., Pampa; George A. Musselman, San Antonio; J. S. Lauderdale, Abilene; H. A. True, Jr., Casper; and H. Jack Polk, Minneapolis.





New Afterburner Looks Promising

• Latest device developed to fight LA's smog is attached directly to auto's manifold. Lab tests show it will reduce smog to pre-World War II level. It cuts down on both hydrocarbon and carbon monoxide.

A MAJOR breakthrough may be developing in the fight against smog on the West Coast.

The promising development centers around an exhaust manifold afterburner under test by Thompson Ramo Wooldridge, Inc., and the Chrysler Corp.

Laboratory tests so far have produced encouraging results. They show the devices could cut smog in Los Angeles to pre-World War II levels.

How it works . . . The device consists of an afterburner attached directly to the auto's engine manifold.

Engine exhaust and air from an engine-driven pump are preheated in a heat exchanger and burned in a combustion chamber. The burnt exhaust then is run back through the heat exchanger and cooled before discharge. The device has only one working part.

Tests indicate effectiveness of the afterburner is on the astonishing side. Smith Griswold, director of the Los Angeles Air Pollution Control District, reported the device has eliminated 80 to 90% of hydrocarbons and 70% of carbon monoxides in exhausts tested in the laboratory.

The developers haven't revealed any cost figures. The afterburner, however, reportedly would sell for around $100 installed on 6-cylinder cars and $125 on the V-8's.

The program . . . Each participant has specific tasks in the cooperative program to develop the afterburner.

Thompson Ramo Wooldridge is handling the primary system's engineering, miniaturization, and construction of prototype units. Chrysler is concentrating on materials, controls, and applications engineering and field testing.

Outside sources estimate the equipment could be ready for general use by 1961.

The new unit is similar in principle to an afterburner developed by Dr. Stuart L. Ridgway of Thompson Ramo Wooldridge and unveiled earlier this year. A significant difference is this: The Ridgway afterburner is a tail-pipe type installation. The new one is attached directly to the engine manifold.

A number of other devices are under development and study, including:

. . . Ford Motor Co. is working on a catalyst-type antismog device which reportedly is 55% effective in eliminating hydrocarbons. However, ac-

cording to reports, it does not eliminate carbon monoxides. It employs Canadian pentoxides as the catalyst.

. . . **General Motors Corp.** is working on a Houdry developed afterburner. Reports are that it is about 70% effective in eliminating hydrocarbon exhaust emissions, but like the Ford device, doesn't affect carbon monoxides.

According to estimates, both the Ford and General Motors devices would cost more in practical applications than the Thompson Ramo Wooldridge-Chrysler unit.

The big problem in auto afterburners is the small concentrations of hydrocarbons involved.

Under ordinary driving conditions, only about 2% of the auto exhaust contains unburned hydrocarbons. This quantity is too small to react with air at normal auto-exhaust temperatures of 400 to 800° F. at the muffler.

In the Ridgway afterburner, for instance, the air added by the engine-driven auxiliary pump and mixed with the exhaust is preheated to around 1,500° F. before being burned up in the combustion chamber. This device eliminated at least 90% of the exhaust hydrocarbons.

The new manifold-installed afterburner will probably require a little additional muffling equipment on cars while the Ridgway device acts in the dual role of afterburner and muffler.

Auto under attack . . . After a number of years waging war against smog on a number of other fronts, Los Angeles smog officials have been concentrating on auto-produced smog in recent months.

In addition to the work on exhaust devices, fuel composition and its relation to smog also have come under close study and regulation.

The Los Angeles County Board of Supervisors passed a law prohibiting distribution of gasoline in the county having a bromine number greater than 30 after June 30, 1960, and greater than 20 after December 31, 1961.

This law, labeled Rule 63, resulted from a series of studies which indicated to smog officials that the olefinic content of gasolines was a major factor in forming air pollutants from auto exhausts. This contention is still disputed, and a joint study is being conducted by smog control scientists and refiners to determine the exact relationship of olefins to smog.

Other possible control points under study in the struggle against auto-produced pollutants is in the field of evaporation losses. Studies have been conducted in determining how low-vapor pressures can be reduced without marring engine efficiency and fuel quality to cut evaporation.

Union Oil Co. of California has been conducting tests with cars equipped with specially designed fuel systems. In these systems, special closures on tank and carburetor vents, plus automatic float bowl drainage, have been used without materially affecting auto operation.

With more than 3 million gasoline-burning vehicles operating in the county, any significant reduction in exhaust contributions to smog would be of major benefit, officials point out. These 3 million vehicles contribute more than 1,000 tons of hydrocarbons and related compounds, and about 450 tons of oxides of nitrogen, to the air daily from their exhausts. This is besides the carburetor and tank vent losses due to evaporation.

AFTERBURNER installed on an automobile tail pipe is being examined by its inventor, Dr. Stuart Ridgway. The device combines oxygen and heat with partially burnt fuel to cause complete combustion and eliminate smog-causing hydrocarbons. The Ridgway afterburner is one of several being developed in an effort to beat LA's smog problem.

Other fields . . . On another front, a weeklong severe smog in late October touched off demands that the fuel-oil burning ban be extended through November. This Rule 62 prohibits use of fuel oil in Los Angeles County during the smog-critical summer months.

But late in October, the city experienced one of its worst smog attacks of the year, despite steel mills being idle and other industries having switched to natural gas earlier when a major forest fire nearby contributed a heavy cloud of smoke over the city for several days.

Under the Los Angeles system, a smog alert is called when the ozone content of the air in any part of the basin reaches a predetermined danger level. A first-stage alert calls for a voluntary curtailment of unnecessary auto travel in the basin until a safe ozone content level is reached again.

All Mobil Lines Put Under Magnolia

THE EASTERN and midwestern pipelines of Mobil Oil Co. will be consolidated into the affiliated Magnolia Pipe Line Co. with headquarters in Dallas.

Mobil's central division office in Wichita, Kans., and the eastern division office in Plainfield, N. J., will become division offices of Magnolia. Most of the general administrative, engineering, tax, purchasing, and accounting functions will be transferred to Dallas.

The move represents a further consolidation of domestic affiliates of Socony Mobil Oil Co., Inc. Exploration and producing activities have been reorganized under Mobil Oil Co.

The new enlarged Magnolia Pipe Line Co. will have more than 15,000 miles of crude and product lines handling some 900,000 bbl. daily.

No Oversupply Cure Seen for Canada

• Some market improvement is coming. But producibility is likely to keep on outstripping production through the next year. The big question is: What will the government do if production doesn't hit the Borden commission level?

Ted Armstrong
News Editor

THERE'S LITTLE likelihood that Canada will be producing 700,000 bbl. daily by the end of 1960. The markets just aren't there.

The 700,000-bbl. production goal was recommended by the Borden Commission as that level needed to insure a healthy growth for the Canadian oil industry.

Canadian producers generally believe they'll come reasonably close to a market of that size within the next year. But they feel that the Borden Commission either set the figure too high or gave the industry too little time in which to reach the goal.

The 700,000-bbl. figure represents an increase of about 200,000 bbl. daily over an average of around 500,000 bbl. during the first 9 months.

Most producers think the end of 1960 will see production in the neighborhood of 600,000 to 625,000 bbl. And they wonder what the dominion government — represented by the new Energy Board—will do in such an event.

There will be pressure from some to follow the Borden recommendations to the letter—arbitrarily restrict imports into Montreal and encourage building a cross-country crude-oil line to move Alberta crude into Montreal refineries.

But the majority seem to feel that the big crude line would be uneconomic and would require either lower prices to producers or higher product prices to eastern consumers.

And, they say, it would take a lot of pressure to force either on Canadians.

The outlook . . . Here's what Canadian producers are hoping for to increase their output:

. . . Western crude, moving through Interprovincial Pipe Line, will push Montreal products completely out of Toronto. This would mean Toronto refiners could buy 50,000 bbl. daily more than they now are taking. The producers talk wistfully, too, of reversing the flow of the Montreal-Toronto products line. This would further increase use of western crude in Toronto and back some foreign crude out of Montreal.

. . . Montreal refiners will voluntarily do some horse trading with Puget Sound refiners so that, while foreign crude continues to be processed in Montreal, the Puget Sound area will use more crude from western Canada.

. . . There will be a sizeable growth in local Canadian markets, prompted by an expanding economy.

. . . Canadian crude will share the benefits of any market growth in the northern U. S. markets where it now flows.

. . . If these don't develop enough extra market, the dominion government will take some action to increase the use of Canadian crude.

Dark spots . . . But all isn't optimism. The Canadians have some fears, too. Here are some of them.

. . . A price break in southern Saskatchewan. Crude in Weyburn field has been selling at three different prices and a spread of 38½ cents a barrel. If the field price should settle at the lower figure, they feel it would break local markets in the U. S. and bring a cry for halting Canada's present "free" status under the U. S. import-control program.

. . . The St. Lawrence Seaway. Three cargoes of imported crude so far have been dropped by tankers coming in the seaway—sopping up part of western Canada's already restricted market.

The latest of these is scheduled to be dropped this week at Fort William, Ont. It is a tanker load of Venezuelan crude for delivery to Husky Oil & Refining Co., Ltd.

It will replace crude normally purchased from producers in Weyburn and Midale fields of southeast Saskatchewan. The Fort Williams refinery normally uses 3,800 bbl. of Saskatchewan crude daily.

Husky said the economics of transportation was the factor which led it to take the Venezuelan oil. But the delivery prompted a new call for restrictions.

Charles S. Lee, president of Western Decalta Petroleum, Ltd., said:

"Quotas should be imposed, but not as a direct result of this particular shipment. This is just a symptom of the general problem we are facing, and that is the dumping of distress crude in various parts of Canada. Canada is now practically the only open market for such cargos."

. . . Alaska. This new oil province poses a direct threat to Alberta's markets. By tanker, Alaskan oil could be moved to the Puget Sound area well below the 10½ cents a barrel at which Alberta crude moves by pipeline.

. . . The northern islands. This is a distant threat and perhaps not a large one. It will be years, if ever, before commercial production of any volume is established in the islands north of the Arctic Circle.

Too, many Canadians feel the logical market for such crude would be England, rather than Montreal. Yet, they're conscious of the fact that these are dominion lands and the dominion, not the provinces, would reap the 12½% return from oil production there.

With the dominion government short on funds, and holding "no great love" for the "rebel" governments of Alberta and Saskatchewan, western oil men expect no favors in competition with any reserves developed there.

PROCESSING

Bechtel Corp., San Francisco, have been licensed to provide design, engineering, and construction services for the new Isocracking process developed by California Research Corp. (OGJ, Oct. 24, p. 48). Bechtel built the first commercial Isocracking unit at Standard of California's Richmond, Calif., refinery.

A new laboratory in Parsippany, N. J., will expand research and development facilities of Texas-U. S. Chemical Co. Construction will begin in May. Texas-U. S. is jointly owned by Texaco Inc. and U. S. Rubber Co.

A Hunt Oil Co. affiliate will build a natural-gasoline plant at Alta Loma, Tex. The plant, which will have a capacity of 25 million cubic feet daily,

In brief, things could get worse before they get better.

Since the Borden report there has been a steady decline in the amount of oil produced in Alberta.

Production dropped from 388,000 bbl. daily in August to 338,819 bbl. in October. Nominations for November totaled only 322,353 bbl. daily.

The problem . . . Canada's difficulty is geographical.

Its oil is in areas of sparse population, almost a continent away from its big consuming areas.

And Alberta, the biggest oil producer, must take a back seat to both Saskatchewan and Manitoba for any market except the West Coast.

Alberta's problem, at least, is that all of its markets are more easily, and usually more cheaply, supplied by other sources.

Barring a sharp and unexpected upturn in world demand, Canadians agree that their only immediate hope for expansion is at the expense of U. S. producers. But many firmly believe that the majors who operate in both countries will do whatever is necessary in shutting in their U. S. crude so that Canada's markets can expand enough to forestall any threat of government intervention.

If this doesn't happen, it looks now as if Canada's producers will be in the mood for dominion controls.

As one Calgary-based producer puts it: "Canada is the only major producing country which has no provision for protecting its producers. Why should the East Coast majors have free reign to import foreign oil while Canadian production goes begging?"

How Shell Sees Canada's Market Growth

W. M. V. ASH, president of Shell Oil Co. of Canada, Ltd., sees a normal market for Canadian crude at the end of 1960 of 620,000 bbl.

Addressing the Canadian Club of Montreal, Ash indicated the last 80,000 bbl. in the 700,000-bbl. goal of the Borden Commission, will be difficult. And he warned that Canada should not fly in the fact of discouraging economics to force the issue.

"There is nothing in this situation that, if left alone and not tinkered with, we cannot by ourselves put right." The industry, he said, should turn its back on "measures born of impatience."

The cross-country crude oil line to Montreal, he said, is a harder route to increased production than going after greater exports.

Actually, Ash said, Canada has been lucky. In spite of its short-term problems, it faces a possible doubling of its oil output by 1967, a better prospect than for most other Canadian resources. The Borden Commission report, in fact, indicated a normal market of 625,000 bbl. daily by 1961 and 1,000,000 bbl. daily by 1967, he said.

ASH'S PREDICTION OF FUTURE MARKETS

	B/d
Borden Commission objective end 1960	700,000
Less normal domestic demand end 1960	443,000
Remaining	257,000
Less normal export demand end 1960	118,000
Remaining	139,000
Less reduction in Ontario foreign crude runs and Ontario refiners increase	59,000
NEW EXPORTS REQUIRED	80,000

What next? . . . Chances are the Canadian industry will rock along with little change for the next 6 months, with producibility continuing to outstrip production.

Canadians now figure they could produce 1,000,000 bbl. daily, if they had the markets, or more than twice what they're selling.

In the end, it will be up to the energy board, headed by oil-wise Ian McKinnon, to decide what action should be recommended.

But the energy board at the moment is slow in getting started. It has staff problems, generated in part by a low salary scale imposed by dominion officials. This is making it difficult to attract competent men from the oil companies, most of whom are reluctant to leave western Canada for Ottawa on any basis.

It is now estimated that it may be February before the Energy Board is in business. And it will be long after that before a new study points toward a solution of Western Canada's oversupply problem.

BRIEFS . . .

will process gas from several fields in the area. Hudson Engineering has the construction contract and will begin work shortly. Completion is set for next spring. The plant will be just outside Alta Loma in Franks field, Galveston County.

Dow Chemical Co. will build a styrene-butadiene latex plant at Allyn's Point, Conn., and expand its existing plant at Freeport, Tex. The Connecticut plant will be built near two other Dow plastic plants which make Styrofoam and Styron. Production is scheduled for early 1961.

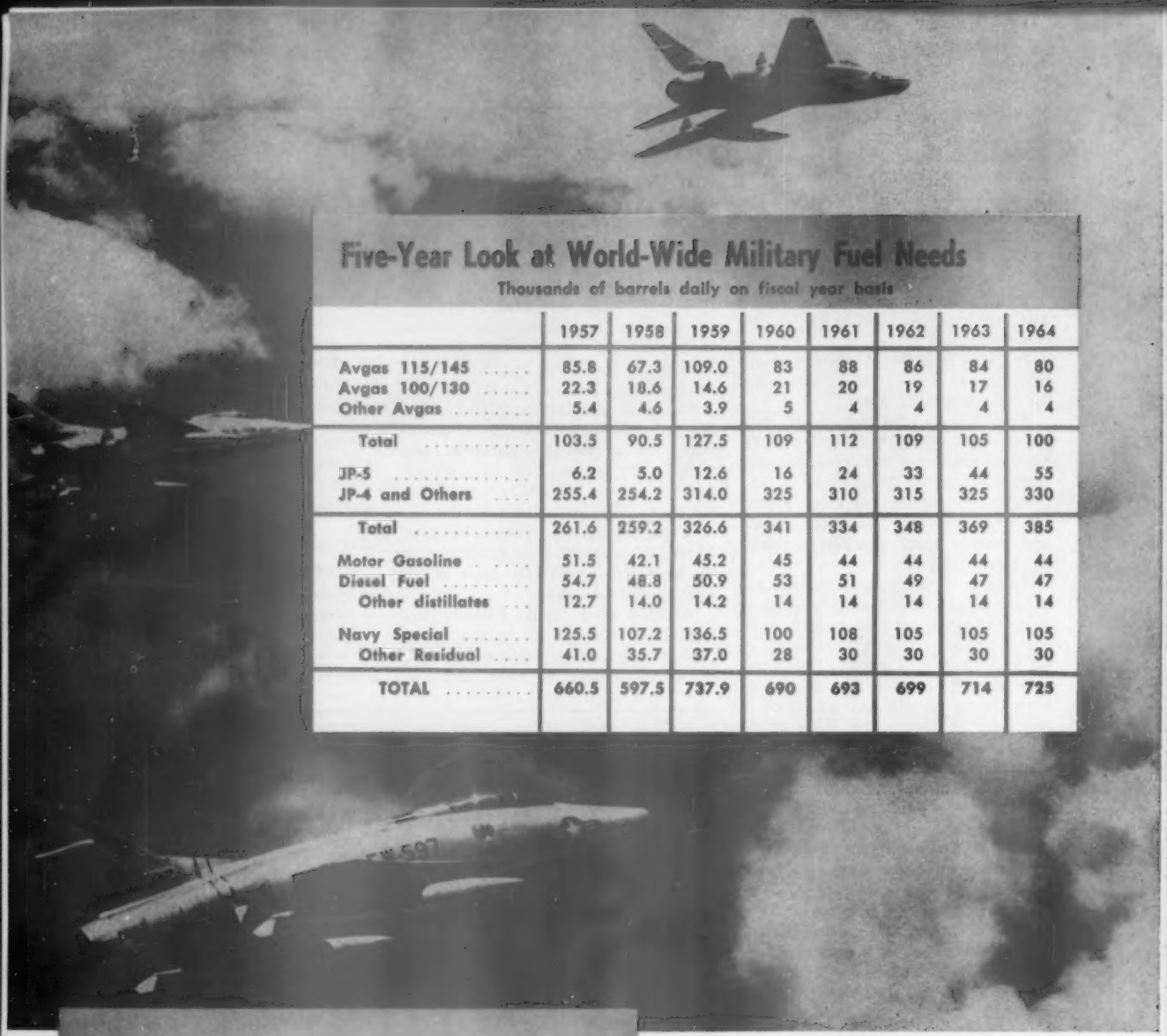
A 75,000 M.c.f. per day gasoline plant will be built by Tidewater in Hollywood-Houma fields area, Terrebonne Parish, Louisiana. The plant will process separator-residue gas currently produced through lease separators. Using a low-temperature absorption process, the plant is expected to recover 1,030 bbl. of liquids daily.

Three separate operations will be consolidated into one division at Dow Chemical Co.'s Bay City, Mich., petrochemical complex. The three operations are the petrochemicals plant, producing ethylene, butadiene, etc.; the polychemicals plant, producing polyethylene and polypropylene plastics; and Bay Refining Co., supplying petrochemical feed stocks as well as other petroleum products. It will be known as the Saginaw Bay Division.

Also for Refiners . . .

IN THE NEWS: New type afterburner attached directly to auto's manifold is promising weapon in smog fight (p. 48) . . . No easy cure is seen for Canada's oversupply problem (p. 50) . . . Military oil buying is dropping this fiscal year but will bounce back (p. 52) . . . Carbide stresses integrated research in new South Charleston center (p. 58) . . . Four unions campaigning at Esso's Baton Rouge plant (p. 59) . . . Esso Research opening new research center near Linden (p. 60).

PLUS THESE TECHNICAL REPORTS: Central electrical control system means better operation (p. 70) . . . Automatic programing can cut computer operating costs (p. 80).



Five-Year Look at World-Wide Military Fuel Needs

Thousands of barrels daily on fiscal year basis

	1957	1958	1959	1960	1961	1962	1963	1964
Avgas 115/145	85.8	67.3	109.0	83	88	86	84	80
Avgas 100/130	22.3	18.6	14.6	21	20	19	17	16
Other Avgas	5.4	4.6	3.9	5	4	4	4	4
Total	103.5	90.5	127.5	109	112	109	105	100
JP-5	6.2	5.0	12.6	16	24	33	44	55
JP-4 and Others	255.4	254.2	314.0	325	310	315	325	330
Total	261.6	259.2	326.6	341	334	348	369	385
Motor Gasoline	51.5	42.1	45.2	45	44	44	44	44
Diesel Fuel	54.7	48.8	50.9	53	51	49	47	47
Other distillates	12.7	14.0	14.2	14	14	14	14	14
Navy Special	125.5	107.2	136.5	100	108	105	105	105
Other Residual	41.0	35.7	37.0	28	30	30	30	30
TOTAL	660.5	597.5	737.9	690	693	699	714	725

Military Oil Buying Will Drop, Then

- Oil's biggest customer will buy less this fiscal year, but Pentagon tells the Journal armed forces' needs will climb back to a near peak in 1964.

John P. O'Donnell
District Editor

U. S. MILITARY requirements for the major petroleum products will drop in the current fiscal year. But, for the 5-year period beginning with fiscal '60, there is little change in prospect in the total military demand.

That's how it looks today to the staff of Vice Adm. Burton Biggs, USN (Ret.), head of the Petroleum Logistics Division of the Office of Assistant Secretary of Defense. One of the functions of Admiral Biggs' staff is to keep track of the petroleum needs of the various services.

Here's how his staff sees the picture today:

Military demand in the fiscal year ended June 30, 1959, was 737,900 bbl. per day, a cold-war peak. One big reason for last year's high rate was to compensate for the reduced purchases of the preceding year. Then, economies forced cutting stocks in many places to absolute minimums.

This year, fiscal 1960, will see total military needs of major products drop to 690,000 bbl. per day. A slight increase is looked for in each of the next 4 years and, by 1964, they are expected to be back around 725,000 bbl. per day.

Admiral Biggs qualifies estimates of future demand with a multitude of ifs. The two most important are the possibility of unexpected emergencies or the possibility of a stringent economy wave. The former could inflate demand figures tremendously, and the latter could deflate them appreciably.

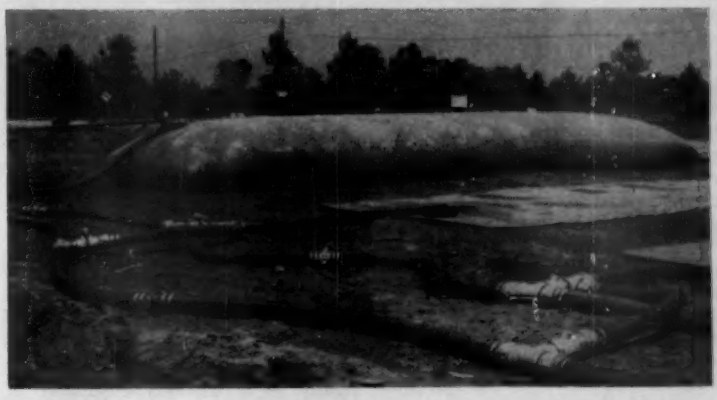
Military can keep field troops supplied with oil

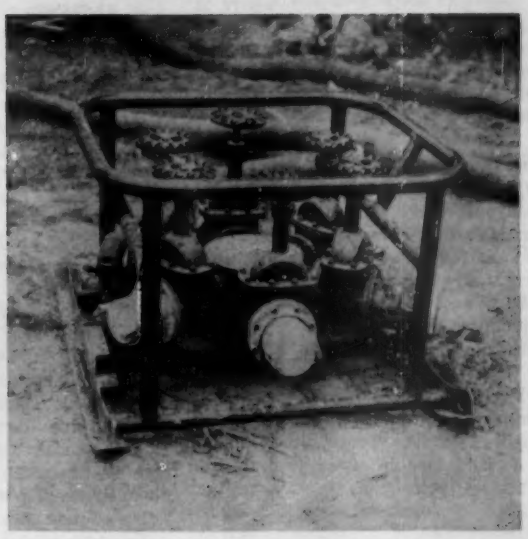
PORTABLE equipment has been designed by the U. S. military to assure ground troops in any future war a supply of petroleum products. The equipment includes:

Collapsible, 10,000-gal. storage tanks (right) made of two-ply nylon fabric and internally coated with a gasoline-resistant material.

A loading rack (lower left) which resembles a giant praying mantis. It weighs 120 lb. and has a counterbalanced swing-loading spout.

A distributing manifold (lower right) with six radially-located, 4-in. connections.





Bounce Back

The sum of guesses of the Army, Navy, and Air Force of their petroleum needs this year adds up to just about 6.5% less than actual demand in the past year. It is not an across-the-board cutback. Two products, avgas and residual fuel oil, account for the whole reduction. They drop enough to offset small gains in most other products.

In fiscal 1959, avgas demand averaged 127,500 bbl. per day. This year it is expected to hit 109,000 bbl., a drop of 18,500 bbl. At the same time, military demand for Navy Special and other residual fuel oil is expected to drop from 173,500 bbl. per day to 128,000 bbl., off 45,500 bbl.

Jet fuels . . . These decreases will be partially offset by a substantial jump in jet-fuel demand. Both JP-4 and JP-5 requirements are up this year. Together, they will be 14,400 bbl. per day above 1959. Motor gasoline and diesel fuel will be up slightly.

One of the surprises of the latest estimate of military needs is the continued high demand for avgas. It ran 127,500 bbl. per day last year and will, according to the current estimates, remain at 100,000 bbl. or more per day through 1964.

The latest projections for avgas demand are up sharply from a year ago. Now it looks as though demand will run as much as 30,000 bbl. per day more than was projected last year.

It is convincing evidence that, while the jet age is here, the piston age is not wholly past. And it won't be ended for some time to come. The Navy, for example, expects to be using piston planes through the '60's.

Last year at this time, it looked as if avgas was on its way out. Then estimates of demand dropped gradually from an estimated 117,000 bbl. per day in 1959 to 69,000 bbl. per day in 1963. Now it looks as if avgas demand will still be around 109,000 bbl. per day this year and not less than 100,000 bbl. per day in 1964.

While avgas will hold on better than expected, jet fuel is expected to fare a little worse than it looked a year ago. Demands for jet fuel have been scaled down by 40,000 bbl. per day in comparison to previous years' forecast.

The scaling down has come entirely in JP-4 since the guesses on JP-5 have been increased. Demand for JP-5, used almost exclusively by the Navy, is expected to go from last year's average of 12,600 bbl. per day to 55,000 bbl. in 1964.

With the airlines using kerosine-type jet fuels, there is some concern over the ability of the industry to meet demands for JP-5 in the future. The Navy plans to up its take in order to help broaden the base of supply.

It has found that JP-5 can be used interchangeably with marine diesel. The Navy plans, therefore, to use JP-5 as a marine diesel fuel wherever logistically possible. This will increase the demand to some extent immediately and should tend to increase the supply at the same time.

With its requirements running around 700,000 bbl. per day, the military remains, by far, oil's No. 1 customer. It's a deal that is apparently working out well for both sides. Oil likes the volume and the military is pretty well satisfied with the fact that it can get what it wants where it wants and when it wants it. All branches of service seem to feel that petroleum products are not only available in ample quantity but also in adequate quality.

Logistics . . . One problem the military is concerned with is its own logistics. It looks back on the supply problems of World War II and shudders at the thought. Then the final means of transportation was small 5-gallon and 55-gallon containers—something like 50,000,000 5-gallon military cans were bought and most of them used for that purpose.

Portable equipment including pumps, pipelines and storage tanks, has been developed since. In the event of a land war in the future, distribution of petroleum products to the battle lines should be surer, faster, and in larger volume.

This is primarily a problem for Quartermaster Corps which would have the job of getting enough of the right kinds of petroleum products to the military forces in a theater of operations. Its Research and Engineering Command has assembled petroleum handling equipment and laid out a system for this job. Here are the principal parts:

. . . Manifold-unit assembly. This distributing manifold has six radially-located, 4-in. connections, three suction and three discharge ports. Three connections are used simultaneously for receiving fuel from as many trucks while one or more outlets lead to the system.

. . . Hose assembly. Two types of hose, suction and discharge, are used. The suction-type is reinforced and rigid. The discharge hose is lighter, not reinforced, and collapsible.

. . . Pump assembly. This is a self-contained, trailer-mounted unit weighing about 1,000 lbs. The pump has a capacity of 350 gpm. It has 4-in., quick-coupling connections on both the suction and discharge manifolds.

. . . Storage tanks. Six 10,000-gal. storage tanks are used in each system. They are 2-ply nylon fabric coated internally with a gasoline-resistant material. When filled, they are 40 ft. long, 10 ft. wide and 4 ft. high. The tanks have 4-in. manifold systems.

. . . Filter-separator assembly. This skid-mounted unit removes free and emulsified water and solid contaminants from fuels. It has a 350 gpm capacity with 4-in. connections.

. . . Loading-rack assembly. This is a portable loading stand weighing only 120 lb. It consists of a 2-in. extra-heavy vertical aluminum pipe riser mounted on a 9-in. base plate, held rigidly by a tripod-type support of 1-in. aluminum pipes. A 2-in., counterbalanced, swing-loading spout is high enough to clear the dome cover hatches of the fuel transporters.

. . . Conversion unit. This unit makes a 1,200-gal. tank truck out of a standard 2½-ton cargo truck. It consists of two 600-gal. tanks, a standard 50-gpm gasoline engine-driven centrifugal pump with the necessary piping and hose. The hose is mounted on reels. Total weight of this unit is 3,000 lb. Lighter weight, higher capacity pumps are now being developed by the Q. M. Research and Engineering Command.

In supplying petroleum fuels within an overseas theater, well dispersed parallel pipe lines would carry fuel from separate storage areas to the combat zone. These lines would be connected to permit drawing from either storage area.

En route, these lines would supply airfields and empty into intermediate tank farms and storage terminals in combat zone. Tank trucks, primarily of 5,000-gal. capacity, would carry the fuel then to the portable storage in the corps area. From that point on, distribution to consuming units and equipment in the division area would be made by 5,000 and 1,200-gal. tank trucks and 1,200-gal. converted units.

High mobility, cross-country 5,000-gal.-capacity vehicles (GOERS) are under development and will be used to supply forward units.

This system was adopted by the Q.M. earlier this year in the latest of a series of moves to solve the problem of petroleum products deliveries to battle fronts.

It's the Quartermaster's answer to the problem it describes this way: "Since the use of military vehicles has increased, and fuel consumption per vehicle has also increased, a revised and more efficient distribution system is of the utmost importance."

Discovery Opens

• Standard wildcat flows 143 bbl. daily from 8,500 ft. off Jefferson County.

A NEW oil discovery in the Gulf of Mexico off the Texas coast opens the first field found in this state's tidelands area in more than a year.

The discovery by Standard Oil Co. of Texas is in Federal Tract 52, 10 miles off Jefferson County, and 39 miles east of Galveston.

It raises to 11 the number of Texas fields in the Gulf of Mexico, not counting offshore extensions of onshore fields. It is the fifth with oil production.

Nearest other production is 9 miles north at McFaddin Beach, just off the Jefferson County coast, and at Block 10-L gas-condensate field, 12 miles northeast.

Standard's discovery well is productive from an 8,500-ft. horizon after plugging back to 8,548 ft. from total drilled depth of 9,922 ft.

It flowed at the rate of 143 bbl. of 35°-gravity oil per day through 12/64-in. choke during a preliminary test of a 24-ft. interval at 8,512-36 ft. Flowing pressure was 730 psi.

PIPELINE

An extension of the Kaneb Pipe Line's products line in Kansas, Nebraska, and South Dakota has been completed. A 111-mile 6-in. line was laid from the Cooperative Refinery Association refinery at Phillipsburg, Kans., to the Fairmont terminal near Geneva, Neb. A 168-mile 6-in. extension was laid from the Fairmont terminal to a point near Yankton, S.D. Williams Brothers Co. had the pipelaying contract, with construction supervision under Pipe Line Technologists, Inc. The expansion also included new terminals at Norfolk, Neb., and Yankton and pump stations at Phillipsburg and Fairmont.

Construction will begin this week on a 42-mile 24-in. gas line for Columbia Gulf Transmission between Erath and Patterson, La. Western Pipe Line, Inc., has the contract for the project under Superintendent J. C. Oliver, headquartered at New Iberia, La.

Construction is under way on a 29-

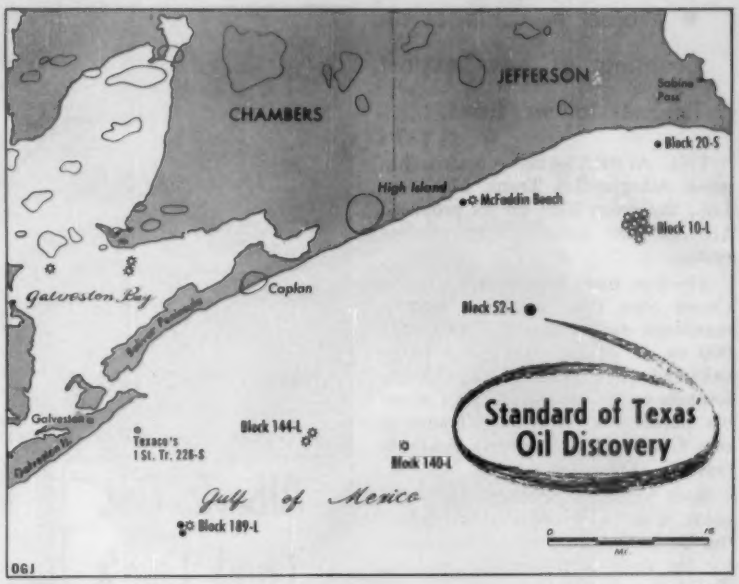
First New Texas Offshore Field in a Year

Other ventures . . . This is Standard's second test on the block.

The first, completed early in 1956, was a dry hole after drilling to 11,671 ft.

Last previous Texas offshore field discovery was in Block 140, 15 miles southwest, where the same company found gas production in August 1958. This was one of two new fields opened that year. Just a month before, Hunt Oil Co. had completed an oil well as a new discovery in State Tract 20, about 2 miles offshore southwest of Sabine Pass.

More recently, in April, this year, Standard completed its second well in the above Block 140 field, opening a deeper gas sand and extending production a mile southwest.



Luck sparse . . . Unlike the more extensively explored Louisiana tidelands where numerous fields have been uncovered over a wide area, Texas' offshore areas have proved less attractive with only widely scattered, spasmodic wildcatting.

In only two field has any sizable amount of development been done. Most important so far has been Chevron field, discovered in 1954, just off the coast of Kleberg County in the lower coastal region where Standard of Texas has been the major operator. Next is the previously mentioned Block 10 field of the upper coastal area, where Magnolia Petroleum Co. (now Mobil Oil Co.) has completed 10 gas-condensate wells.

This year's drilling has dropped to a mere dribble. Currently, the only well drilling, other than Standard's Block 52 discovery operation, is a wildcat by Texaco Inc., in State Tract 226-S, 3½ miles offshore and southeast of Galveston. Spudded last July as a 10,000-ft. test, the well is drilling below 7,500 ft. after several sidetracking operations.

BRIEFS . . .

mile 20-in. line for Transcontinental Gas Pipe Line in South Texas. O. R. Burden Construction Corp., Tulsa, has the contract for the line in McMullen and LaSalle counties.

A **products terminal** with 195,000 bbl. of capacity will be built by Ohio Oil near Brecksville, Ohio, between Cleveland and Akron, permitting the company to enter Cleveland as a marketer for the first time. The terminal will receive products through Buckeye Pipe Line and will serve a 70-mile radius. Chicago Bridge & Iron Co. and General American Transportation Co. will construct five storage tanks. The terminal will be in operation by early spring.

Settlement of natural-gas rates which Colorado Interstate Gas charges wholesale customers has been made in meetings under supervision of the FPC staff. CIG President W. E. Mueller said that rates for 1958, 1959, and the future were established, with CIG agreeing not to file for any increase to become effective before January 1, 1961. The settlement involves refunds of $11,800,000 and a 17% reduction in wholesale rates, and firms up CIG rates for the first time since January 1954.

El Paso Natural Gas Products Co. now holds 100% interest in Odessa Butadiene Co. and 75% interest in Odessa Styrene Co. as the result of acquiring minority interests held by United Carbon Co. Terms of the deal involving the two Odessa, Tex., companies were not disclosed.

The sixth edition of API Standard 1104, "Standard for Field Welding of Pipe Lines," has been published by the API Division of Transportation. The latest edition eliminates provisions for "limited service welders." Copies may be obtained from the Publications Section, API, 50 West Fiftieth Street, New York 20, N. Y.

The Louisiana Mineral Board has decided to defer collection of natural-gas royalty payments which accrue as a result of higher gas rates paid under bond. The royalties will be paid by lessees of state land after the FPC approves the higher rate. The board made the ruling because it could not guarantee to repay royalties to producers in the event the higher rates failed to win FPC approval.

Also for Pipeliners . . .

IN THE NEWS: Alberta Gas Trunk Line wins approval for $103-million Alberta foothills gas pipeline system (p. 56) . . . Practical gas regulation depends on help industry gives FPC, Stueck tells INGAA (p. 59) . . . FPC decisions affecting gas are being challenged in court (p. 62) . . . LPG will continue to grow at annual rate of 5% (p. 62).

A complete list of pipeline projects is carried in the last issue of each month. Current projects are carried in pipeline briefs.

PLUS THESE TECHNICAL REPORTS: New terminal for Lake Maracaibo (p. 92) . . . Argon-41 as a gas-flow tracer (p. 99).

Alberta Foothills Gas Line Gets Approval

- **Project now hinges on granting of new export licenses to two firms.**

THE ALBERTA Government has given Alberta Gas Trunk Line Co., Ltd., the green light on its proposed $103,145,200 foothills gas pipeline system.

The line, from Berland River to the Crows Nest Pass area, will have a maximum daily delivery of 663,300,000 cu. ft. of gas. The gas is to be delivered from fields in the Alberta foothills to the Alberta-British Columbia border for Westcoast Transmission Co., Ltd., and Alberta Southern Gas Co., Ltd.

Both Alberta & Southern and Westcoast now have applications before the U. S. Federal Power Commission for the right to import the gas into the U. S.

The Alberta Government already has approved export of a large portion of the gas sought by the two companies and will shortly consider the export of additional amounts. Export must be approved by the National Energy Board in Ottawa.

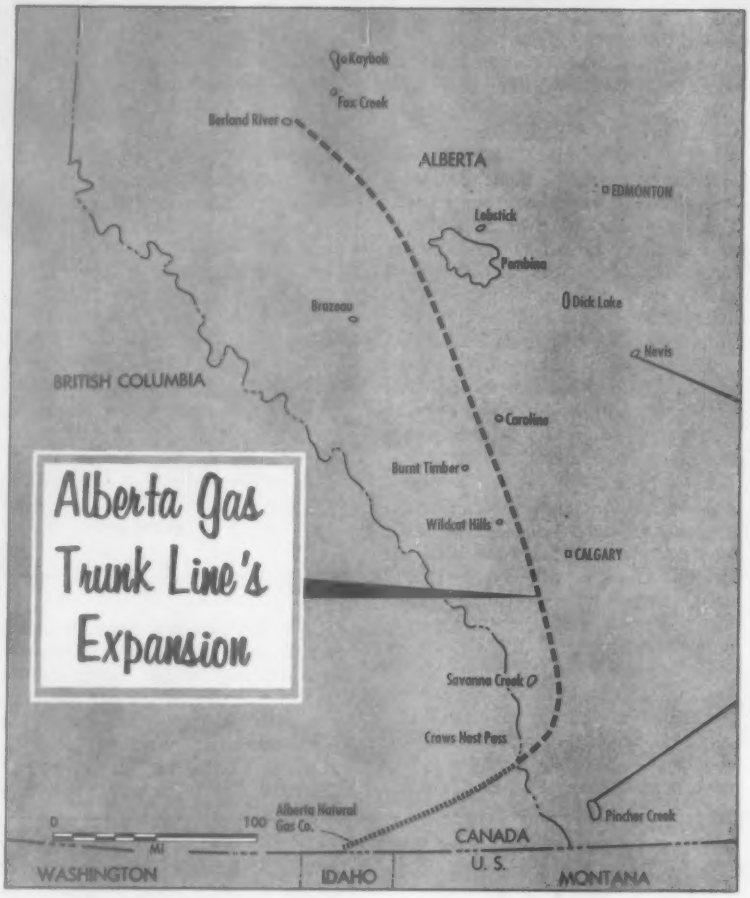
Trunk Line plans to begin work on the foothills line at the beginning of the 1960 construction season, providing the two export companies obtain export permits in time. If work is begun early in 1960, it's expected the line will be in operation by late 1961.

The government permit authorizes Trunk Line to construct the Alberta portion of the line, its facilities, and laterals with the exception of laterals to Savanna Creek, Wildcat Hills, and Kaybob. Trunk Line will make application for the right to construct these three laterals in November.

The line will be designed to carry 163,300,000 cu. ft. of gas daily for Westcoast and 500,000,000 cu. ft. daily for Alberta & Southern.

Virtually all the gas is destined for the California market. The Alberta & Southern gas would move to lines owned by the company's parent, Pacific Gas & Electric Co., which would move the gas to the San Francisco area. Most of the Westcoast gas would go to Pacific Northwest Pipe Line Corp., which is planning a line into California.

More exports sought . . . The Alberta Oil and Gas Conservation Board has completed hearings on an application by Alberta & Southern to almost double the amount of gas it may take from the province during the next 25 years. Recommendations of the board will be sent to the provincial government.



Alberta & Southern now has a permit from the government to export a total of not more than 400,000,000 cu. ft. of gas in any 1 day, or more than 135 billion cubic feet in any year, or more than 2 trillion, 300 billion cubic feet in the duration of the permit.

The company is now seeking the right to export to the California market a total of 4 trillion 200 billion cubic feet of gas over the duration of their permit; not more than 500,000,000 cu. ft. daily, and not more than 168 billion cubic feet in any 12-month period.

The additional gas is being sought on the basis of new discoveries and estimated increased reserves in areas already under contract to the company.

New contracts, options, obligations, and other arrangements have been obtained by the company in Brazeau River, Burnt Timber, Fox Creek North, Fox Creek West and Kaybob fields. Also under contract, but not included under the previous Alberta permit, are the Fox Creek, Caroline, and Lobstick areas.

As now planned Westcoast and Alberta & Southern will share pipeline facilities in the Alberta and B. C. portions of the pipeline.

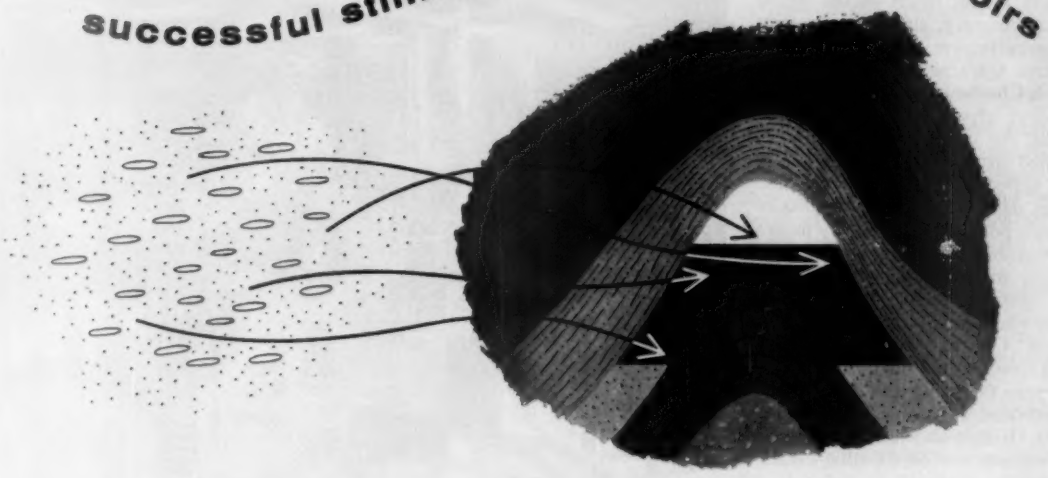
The company also is seeking permission from the board to have the time limit of the gas export permit changed to 25 years from the date of first delivery of gas.

The proposed gas export project would cost more than $330,000,000, including the Alberta portion to be built by Alberta Gas Trunk Line.

Westcoast is to appear before the board later this month to seek an increase in the amount of gas which it may export from Alberta. New reserves and improved gas-transmission methods are the basis for its requested increase.

HALLIBURTON
SANDOIL:

successful stimulant for stubborn reservoirs



More successful fracturing treatments have been accomplished by Halliburton Sandoil than by any other fracturing process. Used to create oil drainage systems ... opening new flow channels for profitable production ... Sandoil is adaptable to individual well requirements in three important ways:

- Fluids may be selected to meet requirements of bottom hole temperature, injection rate and pipe size.
- Emulsion problems may be controlled by Howco Hyflo and other surfactants that precede, follow or are mixed with the fracturing oil.
- Fracturing oils are selected for compatibility with the formation crude.

In addition to its flexibility, Halliburton Sandoil is economical ... It uses low-cost crude or refinery cuts and blends ... permits large volumes of fluid and sand to be used at minimum expense. And Halliburton's variable-ratio proportioners are sized to the job.

Sandoil fracturing is convenient, too; no gelling additives are required.

Flexibility to meet well conditions—economy—and convenience ... these are only three reasons why Sandoil is the world leader in fracturing stimulation. Ask Halliburton for more information about Sandoil ... for *your* well's requirements.

HALLIBURTON

FRACTURING SERVICES

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

"CONTINUE TO LOOK TO HALLIBURTON — FOR LEADERSHIP"

Carbide Stresses Integrated Research

• New South Charleston center combines talents of research, engineering, and development. Object: To carry a research discovery straight through to commercial operation.

COMPUTER-controlled processing, an avidly sought target of the petrochemical industry, has been brought close to perfection at Union Carbide Chemicals Co.'s new technical center at South Charleston, W. Va.

Ethylene glycol is being manufactured at the center by a computer-controlled process.

The system measures, records, and analyzes data on operating conditions at various points in the unit. By means of a program based on proved process variables, the computer controls the whole operation to obtain maximum efficiency and productivity.

Union Carbide expects to learn enough from this installation to enable it to apply the same controls to full-scale ethylene oxide manfacturing operations. It may also lead, it is hoped, to similar automation of other chemical processes.

This is one of a number of intriguing projects under way at the center, which was formally opened in the presence of more than 100 educators from the leading sicentific schools of the country.

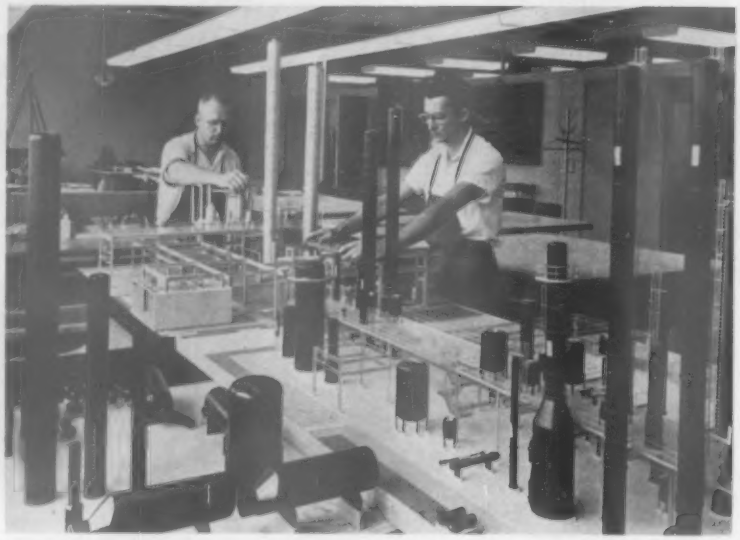
Another, the commercial manufacture of sevin, was cited by E. E. Fogle, president, as an example of the interdependence of the units that make up the center and their relationship to other departments.

This product, commercially labelled Crag Insecticide Sevin (1-Naphthyl N-Methylcarbamate), is effective in controlling a variety of insects, primarily the boll weevil and the gypsy moth.

Sevin was discovered 5 years ago and is now in limited commercial production. Some 54 persons are engaged full time in transplanting small-scale to full-scale production to meet the demands of the 1961 crop year.

Three departments in Research and Development have 12 full-time people on the project, in addition to 14 at the South Charleston and Institute plants, 20 in process engineering, and 8 in design and construction. Over and above these full-time participants are an even larger number on a part-time basis.

Other significant projects under way at the South Charleston technical center are the preliminary design of a large-scale commercial unit for the production of polyox water soluble resins and the synthesis of epoxy compounds. So far, 775 such compounds have been synthesized and 8 have been chosen for commercialization.



MODEL MAKERS are a part of research at Carbide's new center. Scale models help in designing special process equipment, in site planning, and in layout of processing equipment.

Integrated research . . . Carbide's handling of the sevin project helps explain its setup.

The center combines research, development and engineering. This way the talents of the company's principal technical groups are brought together so that their interrelated activities can be conducted most effectively.

The center is a 12-building complex at South Charleston. In addition to the three principal buildings devoted to research, development, and engineering, there are two high-pressure laboratories with 39 test cells, one chemical and two plastics resins plants, an applications research laboratory, a radiation laboratory, cafeteria, and the necessary supporting buildings.

Present staff adds up to 1,700 people of whom approximately 1,000 are scientists. They are divided up this way: Engineering, chemicals, 210; engineering, olefins, 150; design and construction, 590; development, 290, and research, chemicals, 460.

The staff is supported by a number of unusual aids. An example is the use of an indexing system coupled with IBM sorting equipment in one of three technical libraries. This makes it possible to retrieve information from reports and other material even when there is limited knowledge available about the author, title or scope of the report.

Another unique unit is the plant's reproduction department. This department is equipped with standard and large-size offset printers, 42-in. blueline machines, photographic equipment, photostat and dark room cameras, copying equipment and a bindery with an electronically controlled collator that can handle up to 50 100-page books at one time.

Room for growth . . . The dozen buildings that now make up the center are accommodated on 100 acres.

With a total site of 508 acres, there is plenty of room for expansion . . . and Carbide foresees considerable expansion in the future. Not only will the present site accommodate more buildings but the principal buildings will accommodate more floors.

The company gives every indication that expansion is in order: Last year it spent $70,000,000 on research and this year it will spend about 10% more.

Stueck Says Cooperation Key to Gas Rules

• Practical regulation depends on help industry gives FPC, and conference is good start, commissioner tells INGAA.

A PRACTICAL way to regulate producer prices for the sale of natural gas to interstate pipelines can be found.

It can be done if all interested parties will cooperate in developing a set of standards which the Federal Power Commission can use in place of the utility-cost formula in determining reasonableness.

This was the suggestion of Commissioner Frederick Stueck of the FPC, addressing the annual meeting of the Independent Natural Gas Association of America in Phoenix.

Stueck revealed that a start toward this has already been made through a current effort to form a natural-gas industry conference sponsored by INGAA, American Gas Association, American Petroleum Institute, Independent Petroleum Association of America, and Mid-Continent Oil and Gas Association.

He urged the industry to carry through with this idea and to enlarge the scope of the proposed conferences to include representatives of the National Association of Railroad and Utility Commissioners, some large cities having a regulatory interest in gas prices, and the FPC staff.

Objectives of this industry conference suggested by Stueck include:

... **Development** of standard definitions and contract terms.

... **Leveling** the seasonal peaks and valleys in the demand for natural gas.

... **Developing** new markets in areas now served with pipelines, since geographical expansion is nearing its limit.

... **Mutual education** of all participants as to the problems of the others.

... **Developing** regulatory rules and practices acceptable to all and to the consuming public.

Stueck seemed to be outlining a substitute for the cost-of-service rate base formula by listing a score of factors he said the industry takes into consideration in arriving at a price in a gas contract. Examples are:

... **Local cost variations** such as well depths, offshore operations, and distance from a pipeline.

... **Rising costs** of leasing, exploration, and drilling.

... **Competition** as influenced by the number of buyers and sellers in the area.

... **Historical** regional considerations.

... **Quality, pressure,** and delivery conditions.

... **Size and deliverability** of the reserve.

... **Taxes, Take-or-pay** provisions, and similar contract terms.

... **Prices of competing** fuels in the intended market.

Without committing the commission, Stueck indicated that if there were some agreement on the relative importance of such factors, FPC could use them in setting area prices without determining the actual costs of individual producers.

He suggested that prices not above the area ceiling could be approved without investigation, and that producers might be able to justify higher prices on the basis of some of the factors he listed instead of by the rate base formula now being attempted.

Prices near peak . . . There is evidence that the price of gas is reaching its economic ceiling in some places right now, Stueck said, and the general level of gas prices cannot advance much more without losing markets to other fuels.

Also, pipeline systems cannot expand as rapidly as in the past and they, therefore, will offer more resistance to higher producer prices than they did a few years ago.

He also expressed the belief that in most places the field price of gas is now high enough to give producers an incentive to maintain exploration, and that they would be willing to take slightly less than the maximum possible price if they could get out from under FPC control by staying within an area ceiling price.

So Stueck seemed to be saying that the problem of fast-rising field prices which so alarmed consumers a few years ago has about run its course. He indicated that the time is right for developing a new and simpler approach to regulating producers' prices.

Unions Busy Campaigning at Baton Rouge

AFTER MONTHS of delay, four unions are now actively campaigning for the votes of workers at Esso Standard Oil Co.'s refinery at Baton Rouge.

The National Labor Relations Board fixed December 2 and 3 as the election dates to determine which union shall be the bargaining agent for some 3,300 workers covered in the bargaining unit.

Involved are the Independent Industrial Workers Association, which has represented the workers in the past; the Oil, Chemical and Atomic Workers Union, which recently scored an election victory at another Jersey Standard-affiliated plant (Humble) in Baytown, Tex.; the Baton Rouge Metal Trades Council, which obtained the required signatures to call the election in Baton Rouge; and the Teamsters Union, which is trying to break into the refinery field under President James Hoffa's leadership.

If none of the four unions get a majority of the votes, a runoff election will be held between the two highest. The workers have the right also to vote against any union representation at all.

The NLRB representative, calling the election, ruled that only production and maintenance workers shall be eligible to vote. The OCAW had sought to have clerical workers and technicians included in the bargaining unit and may still carry an appeal on the issue to the NLRB in Washington.

Record strike . . . At Texas City, a continuous 12-hour meeting last week between the OCAW and the American Oil Co. failed to break a 4-month strike at the Amoco refinery.

Federal Mediator James O. Hubbard, who has tried without success to get a contract agreement, said labor and management are "still some distance apart." Hubbard is leaving on vacation and is being replaced temporarily by mediator John Pennell, Kansas City, Mo.

Amoco, which is operating the refinery with supervisory personnel, said the strike is now the longest conducted by the OCAW at a Texas Gulf Coast refinery. The strike is the fourth at Amoco. The other three—in 1945, 1948, and 1952—lasted a total of 51 days, while the current strike becomes 123 days old this week.

FUTURE EXPANSION is carefully planned at Esso's new Florham Park, N. J., research center shown from the air above. The office building is in center, process-research building at upper left, and services building at upper right.

New Research Center To Be Opened by Esso

- The first of a score of buildings scheduled at Florham Park near Linden will be dedicated this week.

ESSO Research & Engineering Co. back in 1947 had only one laboratory-office building at Linden, N. J.

Now a dozen years and 19 buildings later, it is overflowing to a new site. The 57 acres at Linden are no longer enough.

The new site is at Florham Park, N. J., 15 miles from Linden and about 25 miles west of New York City. Here Esso has a 675-acre tract in gently rolling country. The site is surrounded by residential and institutional properties.

This week Esso will dedicate the first three of a score of projected buildings at Florham Park. These are the office building, a process research building, and the services building. These facilities will accommodate 800 to 1,000 scientists, engineers, and supporting personnel. Eventually, possibly 10 years from now, this number will grow to several thousand.

Since Linden and other existing Esso Research & Engineering facilities will be retained, the addition of Florham Park is dramatic evidence of the spectacular, continuing growth in industrial research. It will be the third Esso research center, with a combined staff of more than 3,000.

In addition to Florham Park and Linden, Esso Research & Engineering has a center at Abingdon, England. There are also the affiliated Esso research labs at the Baton Rouge, La., refinery, staffed by 500 persons.

Joint effort . . . Esso combines research and engineering because it believes that each is dependent upon the other.

Research is meaningless unless engineering can convert its findings into commercially profitable applications. Engineering needs research to develop new processes and to improve old ones.

About one-fourth of this large and growing staff is devoted to fundamental research. At last count, this staff was engaged in more than 1,000 research projects. On top of this, Esso Research & Engineering:

. . . **Designs and engineers** process units for affiliated companies which operate in 62 countries.

. . . **Provides trouble shooters** for refineries of affiliated companies throughout the world.

. . . **Works closely** with research groups of affiliated companies both in this country and abroad.

. . . **Studies masses** of published scientific literature for its pertinence to oil.

Only a couple of statistics illustrate the immense job Esso Research & Engineering is doing and has done:

Not too long ago, Esso added up the cost of new construction its process designers and engineers were working on for affiliated companies. The total was close to $500,000,000.

More than 75% of all gasoline produced in the world contains products of fluid catalytic cracking, a process developed by Esso.

Ability of the company to perform such functions will be enhanced as the Florham Park center develops. It is a campus-type project that will have several distinctions.

Environment, design, and size . . . Environment is of acknowledged importance in research.

It is being given every consideration at the Florham Park development. The site was selected and the buildings and landscaping were designed to encourage thought and discourage distraction.

The office building, accommodating from 700 to 800 people, will be the company headquarters. It consists of a group of three-story, semi-independent wings emanating from central cores. This arrangement will as-

sure each office abundant light and air and a pleasant view. It is air conditioned, and escalators run between floors.

In addition to technical and scientific personnel, the office building houses a correlations and computer center, a 520-seat cafeteria, conference rooms, technical library, medical department, and telephone and teletype rooms. Basic design provides for a 300-seat auditorium.

The process-research building is the first of the experimental buildings to go up. A laboratory building is scheduled for construction later. It will have two 3-story wings emanating from a central core.

All the buildings but one will be grouped around an oval, tree-lined driveway. These will be served by a peripheral driveway that in time will also be tree-lined. The services building is the exception. It will be located some distance beyond the peripheral driveway to minimize service runs as the center expands.

Note to drilling contractors:

Here's a job for old drilling tools

WANTED: Some early rotary drilling tools, preferably from the Spindletop era.

The Smithsonian Institution of Washington, is seeking such tools for the oil industry exhibit it is shaping up.

The institute is now in the final stages of preparing for the initial exhibit, which it hopes to be able to open to the public in January. In assembling the collection to show the development of the oil industry from its initial stages to the present, the officials found that they had no rotary drilling tools.

Because the rotary drill obviously has played a key role in oil development, the institute feels that an exhibit without that equipment would be incomplete.

If you know where such equipment might be available, write to Dr. P. W. Bishop, Head Curator, Department of Arts and Manufacturers, Smithsonian Institution, Washington 25, D. C.

The exhibit to open next year is only the first step. In a new building to be constructed, a much larger hall will be available for a more complete oil industry exhibit. This may be ready in 1962.

Because of the large number of visitors to the museum—over three-million annually are expected when the new building is opened—Smithsonian officials feel that the oil exhibit will be an excellent way of acquainting more of the public with facts about the oil industry, past and present.

watching WASHINGTON

Clyde La Motte

• A new approach for newcomers? . . .

THERE IS a distinct possibility that product import quotas for newcomers may be considered on a case-by-case basis.

The Oil Import Administration has been trying to devise some over-all formula for permitting newcomers to the product import picture, but thus far hasn't been able to arrive at a practical solution. As a result, more thought is being given to the individual approach.

Under this procedure, if adopted, anyone wishing to obtain a quota would make application to the Oil Import Appeals Board.

The board would consider several factors, including the location of the company and its facilities. For instance, a would-be importer of residual fuel who has terminal facilities near a deepwater harbor would stand a much better chance of getting a quota than some inland company.

The status of competitors might also have some bearing. That is, if a firm's principal competitors already have product import quotas, that firm would have a better chance of getting its application approved.

In its final analysis, the board would seek to determine whether, without any import controls, it would be likely that a company would be turning to foreign sources for some of its product supplies.

The motivating factor behind the OIA's desire to make room for some newcomers is the feeling that the Government shouldn't "freeze" the product imports picture.

This "freeze" isn't a problem in crude imports because such quotas are tied to refinery runs. But since product imports have until now been restricted to historic importers, the door has been shut on newcomers.

Obviously, the OIA doesn't want to let in a flood of product imports. Under the case-by-case procedure, new importers would be brought in gradually. Meanwhile, unless there was a substantial increase in total product demand, quotas of old importers would be trimmed back slightly to make room for the newcomers.

Although no decision has been made, the first test of the individual application procedure may be tried on residual fuel imports.

The outlook now is that the over-all total of residual fuel imports may be increased for the next allotment period—the first half of 1960—to insure an adequate supply during the remainder of the heating season.

With this increase in sight, the OIA may decide to consider accepting applications from newcomers.

A decision is likely by December 1, perhaps even sooner, in order to give companies time to make plans to meet their first-half requirements.

The product import problem is only a part of the task of drafting import allocation plans for the next 6-month period. However, it being given by far the most attention because the crude import picture is not expected to change appreciably.

• Gulf fights delay in merger suit . . .

WATCH FOR A KEY ruling by a Federal Trade Commission examiner this week in the FTC's antimerger suit against Gulf Oil Corp. and Warren Petroleum Corp.

The examiner is due to rule on a request by the FTC staff for a delay of 6 months to give it time for a further survey and study of the impact of the merger on competitors.

Gulf's attorneys, decrying the lengthy delays which have already dragged out the case, are opposing any further time extension. Instead, they have filed a petition asking the examiner to throw out the charges for lack of prosecution.

The examiner has shown some irritation over the FTC staff's request for a delay, but insiders doubt that he will dismiss the case. Instead, some compromise decision on the extra time to be given the FTC staff is more likely.

Gas Regulations Must Have Day in Court

- **FPC decisions affecting natural gas are being challenged in courts at double the rate of last year.**

MANY OF the aspects of natural-gas regulation are now going through the court-testing phase—the final step in shaping up such regulations.

For example, the Federal Power Commission noted last week that 10 new petitions had been filed in the courts involving orders issued by the FPC. And a FPC attorney said that new cases filed in courts of appeal have been averaging one a week this year, compared with one every 2 weeks last year.

This increasing flow of cases stems from the fact that regulation of natural-gas producers is still relatively new. As various regulatory questions crop up, the FPC makes the initial ruling—usually after lengthy hearings—but that decision is then challenged in the courts.

A FPC staff official said such challenges were to be expected and likely would continue until definite patterns of regulation are set.

The FPC generally welcomes the challenges because once a problem has been taken to the U. S. Supreme Court and a ruling obtained, a precedent is established.

Initially, the FPC staff member pointed out, the gas industry challenged the over-all authority of the commission to regulate producers at all. With that issue settled by the Supreme Court ruling in the Phillips case, the challenges narrowed down to specific rulings on the regulatory measures used by FPC.

What is challenged . . . Of the new petitions listed last week by the FPC, none covered a particularly vital aspect of regulation, but each involves some facet of the problem.

One of the cases appealed to the U. S. Supreme Court is a challenge of the commission's refusal to limit the term of a producer's certificate of public convenience and necessity to the duration of the contract involved. As the rule now stands, a producer can not abandon service without FPC approval even after his supply contract has expired.

In another case, a company is challenging the FPC's disallowance of a producer's periodic price escalation for failure to submit evidence of cost or profits. Thus, unless the FPC is overruled, costs must be taken into consideration when price escalation clauses are involved.

In two suits the key point is a determination of just who has the right to intervene in a proceeding before the FPC. For the most part, the commission has sought to limit intervenors, pointing out that unnecessary interventions only tend to drag out the proceedings and make them more unwieldly. However, the FPC has been overruled on this point in several instances.

This court testing of FPC rulings, while apparently necessary, obviously adds to the time required for a clear picture of regulation to emerge.

Right now, for example, the commission is struggling to work out pricing procedures in the Phillips case. It is likely to be many months in doing so, and when it does, its decision is almost certainly going to be challenged in the courts. The final, legal determination, therefore, is still probably years away.

Phillips Official Expects Big Things of LPG

THE LPG industry will continue its booming growth during the next several years.

Sales of natural-gas liquids, which have racked up a growth rate as an energy source surpassing even natural gas and electric power, should continue to increase at an annual rate of more than 5%.

This bright forecast for the LPG industry was made by G. W. McCullough, vice president in charge of the natural-gasoline department for Phillips Petroleum Co. McCullough spoke during the southern regional meeting of the Natural Gasoline Association of America in Tyler, Tex.

He predicted that LPG consumed in domestic heating, by far the biggest market at 45 to 57% of total sales during the past 4 to 5 years, will chalk up annual sales gains of between 4 and 6%. Much of this increase, McCullough said, would come as a result of an accelerating trend to suburban living.

Such a percentage gain in domestic heating uses alone, he said, may hike annual LPG sales by 250,000,000 gal.

Spectacular growth in the use of LPG as a motor fuel for internal-combustion engines (up 700% since 1950) will continue to climb at a rate of about 7% a year. Most of this gain will be due to continuing farm mechanization and to increased use by truck and bus fleets.

Irrigation also is consuming more LPG. So are drilling rigs. And most recently, LPG-burning fork-lift trucks for warehousing work have proved popular.

The petrochemical industry, McCullough said, also will continue to consume more and more LPG. Consumption in recent years has run from 26 to 31% of total LPG sold.

Butane shortage? . . . Heavy demand on butanes by refiners may lead to a serious shortage of that product within the next 5 years, McCullough said.

Refiners' demand for butane has shot upward with the rapid expansion of isomerization and alkylation facilities all over the country.

Alkylation capacity, McCullough said, is slated to increase by around 25,000 to 30,000 bbl. daily this year.

Such a demand, he said, will create shortages among other users of butane and butane-propane mix, "and these will be most evident in the South and Southeast areas of the United States."

Supply in good shape . . . LPG supplies are in good shape to meet fast-growing demand, McCullough said.

In the past 10 years, "natural-gas liquids reserves have nearly doubled, increasing from 3.25 billion barrels in 1947 to 6.2 billion barrels in 1958. In Texas, alone, they have gained from 1.986 billion barrels to 3.272 billion barrels."

Much of the added reserves are added through modern processing methods which extract more and more of the total LPG content in the natural-gas stream.

Extraction levels for propane have increased on the average from the 60-65% in 1952-53 to 75-80% today, with some plants recovering as high as 90%, the Phillips executive said.

Trinidad Urged to Adopt New Oil Law

• Walter Levy tells Trinidad Government the island has lost some competitive advantages in European markets; recommends a switch to 50-50 profit split as a means of encouraging exploration and building up better reserves picture.

THE LITTLE Caribbean island of Trinidad is even more closely tied to the apron strings of the international oil trade than most producing-refining countries.

Because of a vital dependence on oil markets which she does not, and cannot, set, Trinidad must take a closer look at all aspects of her oil industry if she is to keep her position.

That's the advice handed the Trinidad Government recently in a comprehensive report on the island's oil economy by Walter J. Levy, New York consultant and one of the world's leading oil economists.

Levy balanced Trinidad's oil books in the 40-page report to the government and found both credits and debits. Here are some of the things he lists on the credit side of the ledger:

...A firmly established industry with proved resources backed by large investments in both production and refining.

...A secure oil source because of both its location and political climate. Its location is a strategic one, giving it access to both the markets of the Western Hemisphere and western Europe and Africa. Because it is one of the few oil-exporting members of the British Commonwealth, Trinidad enjoys a rare access to British markets, plus its special advantage as a source for "sterling" oil in a dollar oil region.

On the debit side of the page, Levy finds:

...A narrow profit margin on local oil operations. Trinidad, with its resources limited by its own geology, must match competitive costs with other more prolific and less expensive countries like nearby Venezuela. In other words it must compete in products markets with petroleum products made from higher volume and lower cost crude produced in the same area.

...A narrow reserve margin compared to current output. Levy estimates Trinidad's ratio of reserves to production at 9 years, compared to Venezuela's reserves that could easily support 16 years of production.

Walter J. Levy
. . . gives Trinidad some tips.

Mere replacement of Trinidad reserves will require a major drilling effort. Revenue from expanded output first has to go to finding more reserves before profits are available. This means Trinidad would be hard pressed to meet competitive pressures in a surplus market.

...Narrowing markets and less price advantages in European markets face Trinidad. Levy points out that Europe has always had to rely on product imports to supplement its own refinery output and still does. European products prices based on Caribbean postings, plus freight, have always kept Trinidad output competitive in Europe.

Refining expansion in Europe, product surpluses, and the rise of Middle East imports all have weakened this traditional European tie to Caribbean prices and at the same time nearly destroyed any competitive position for Trinidad.

All these things are extremely important to a country which produces 100,000 bbl. daily and refines 135,000 bbl. daily of products from its own and foreign crude. Local consumption is only 5,000 bbl. daily. Bunkers account for another 25,000 bbl. daily. The remaining 100,000-plus bbl. daily must go into competitive world markets.

Levy recommendations . . . After sizing up both the advantages and disadvantages Trinidad has in a competitive market situation, Levy said the government should consider several things to improve the position of its industry.

One of the major recommendations was revision of the country's petroleum law which Levy describes as "not very exacting."

He points out that the present law specifies no performance obligation for a concessionaire nor does it require him to relinquish acreage after a reasonable time. He thinks Trinidad's royalty formula based on a field-storage-value formula subjects government income to too many uncertain fluctuations of world product prices.

The same is true of the bulk of Trinidad's oil income which comes from a 40% income tax on corporate profits. Levy suggested that Trinidad consider the traditional 50-50 profit split instead of the income-tax formula in use. He believes it would stabilize government income and would be welcomed by the companies as a means of giving them a predictable base to determine future tax obligations.

He advised that the government might consider eliminating its new percentage depletion provision on offshore operations if the 50-50 formula should be adopted.

He urged that any changes made in Trinidad's legal and tax structure affecting its oil industry be done in such a way that both the industry and the government could benefit.

FLORHAM PARK, NEW JERSEY, is the location of this new Esso Research and Engineering Center.

A NEW ESSO RESEARCH & ENGINEERING CENTER TO SERVE THE OIL INDUSTRY

The ESSO RESEARCH AND ENGINEERING COMPANY is proud to announce a new asset in its industry-wide process licensing program. Recently completed at Florham Park, New Jersey, is a new research and engineering center devoted to the development of improved refining processes and the design of modern, efficient refining and petrochemical units. The new facilities are ideal for development work on refining processes, an area of science in which this company pioneered. Equipment will feature automated pilot plants and high-speed electronic computers. As in the past, fully-developed processes will be licensed to the petroleum industry throughout the free world. The processes now available through the achievements of Esso Research and Engineering include Model IV Fluid Catalytic Cracking, Hydrofining, Powerforming, Fluid Coking, CAA Butadiene Extraction and many others.

ESSO RESEARCH AND ENGINEERING COMPANY
P. O. Box 243 Elizabeth, New Jersey

Your key to progress . . . an Esso Research process.

World Crude Output Stays in Slump

- Gains in Canada and most Persian Gulf producing countries barely offset drops in Venezuela and United States.

FREE-WORLD crude production continued to drag its feet in August with a rise of less than 20,000 bbl. daily.

There was comparatively little change among most of the major producing countries. Venezuela had the biggest change with a drop of nearly 100,000 bbl. daily. U. S. operations were off 18,000 bbl. daily. Canada and all big Persian Gulf producers, with the exception of Iran, showed gains ranging from 25,000 to 70,000 bbl. daily.

Egyptian production declined sharply due to a cutback in fields operated by Cie. Orientale des Petroles, owned by the government, ENI, and Petrofina. Output from the company's fields was 13,000 bbl. daily, half the level of the preceding month.

Among the smaller producing areas in Latin America, all-time records were reached in Colombia, at 155,800 bbl. daily, Trinidad, at 114,000 bbl. daily, and Chile, at 18,100 bbl. daily.

TREND OVER LAST YEAR

	Western Hemisphere less U. S.	Middle East	Total free-world outside U. S.
1958			
August	3,821.2	4,340.9	8,965.8
September	3,769.8	4,535.2	9,120.8
October	3,891.3	4,482.3	9,177.5
November	4,037.8	4,472.1	9,309.5
December	4,119.9	4,446.2	9,371.4
1959			
January	4,311.6	4,369.3	9,449.5
February	4,453.9	4,426.1	9,649.7
March	4,220.6	4,634.2	9,680.7
April	3,910.4	5,646.4	9,396.5
May	3,773.6	4,571.4	9,181.0
June	4,111.5	4,467.9	9,428.7
July	3,914.8	4,532.5	9,293.2
August	3,851.1	4,660.1	9,329.4

World-Wide Crude Production: Daily Average in Thousands of Barrels

Country—	August 1959	July 1959	August 1958
Western Hemisphere			
Argentina	119.7	119.7	92.9
Bolivia	9.1	9.1	9.1
Brazil	68.9	68.9	56.3
Canada	510.1	485.0	445.5
Chile	18.1	17.7	14.8
Colombia	155.8	147.8	129.3
Cuba	0.6	0.5	0.9
Ecuador	7.6	7.6	8.2
Mexico	264.9	264.9	259.6
Peru	48.6	48.5	54.1
Trinidad	114.2	112.4	103.8
Venezuela	2,533.5	2,632.7	2,646.7
Total	3,851.1	3,914.8	3,821.2
Europe			
Austria	45.0	45.7	52.2
France	33.4	33.6	27.6
West Germany	100.4	100.6	88.0
Italy	34.7	32.4	29.5
Netherlands	33.9	33.5	31.1
United Kingdom	1.7	1.7	1.6
Yugoslavia	9.7	9.7	9.5
Total	258.8	257.2	239.5
Middle East			
Bahrain	45.2	45.0	40.5
Iran*	888.0	906.0	884.0
Iraq†	898.0	827.7	790.3
Israel	2.0	2.0	1.9
Kuwait	1,431.5	1,394.8	1,378.7
Neutral Zone	120.0	120.0	80.1
Qatar	171.5	167.3	169.0
Saudi Arabia	1,096.6	1,062.7	990.0
Turkey	7.0	7.0	6.4
Total	4,660.1	4,532.5	4,340.9

Country—	August 1959	July 1959	August 1958
Other Asia			
British Borneo	107.0	107.0	109.6
Burma	10.5	10.5	8.8
India	8.5	8.5	8.5
Indonesia	330.0	345.0	325.5
Japan	7.7	7.4	7.2
New Guinea	4.4	4.4	5.4
Pakistan	5.9	5.9	6.0
Total	474.0	488.7	471.0
Africa			
Algeria	18.6	18.8	10.7
Angola	2.0	2.0	1.6
Egypt	38.4	53.4	62.7
Gabon	15.6	15.0	10.1
Morocco	1.8	1.8	1.5
Nigeria	9.0	9.0	6.6
Total	85.4	100.0	93.2
Free World			
Foreign	9,329.4	9,293.2	8,965.8
United States	6,766.0	6,784.0	6,939.0
Total	16,095.4	16,077.2	15,904.8
Communist Countries in Soviet Orbit			
Romania	235.0	235.0	227.0
Russia	2,545.0	2,545.0	2,260.0
Others	60.0	60.0	60.0
Total	2,840.0	2,840.0	2,547.0
WORLD TOTAL	18,935.4	18,917.2	18,451.8

Figures are from reliable industry reports or government sources. Estimates are made where complete reports are lacking.

*Includes estimated 5,000-bbl. daily from Naft-i-Shah field not operated by Consortium companies. †Includes estimated 3,300-bbl. daily from Naft Khaneh field, operated by Iraq Government.

Conorada in Australian Hunt

. . . with acquisition of a 5,000,000-acre concession in Queensland. Exploration work to start in few months.

CONORADA Petroleum Corp. has acquired a concession of 5,312,000 acres in Queensland, Australia, and will start exploration work late this year or early 1960.

Conorada holds a 5-year term on the big concession and renewal rights for additional 5-year periods.

The concession was acquired from Trans-Pacific Corp. and South Pacific Pty., Ltd., which had obtained the acreage earlier from the Australian Government.

Conorada, comprised of Continental Oil Co., Ohio Oil Co., and Amerada Petroleum Corp., is active in North Africa.

The Australian concession is located in west central Queensland, straddles the Tropic of Capricorn, and covers an area roughly the size of Massachusetts.

Virtually all of the Great Artesian basin, most of which lies in Queensland, has been parceled out in concessions.

The 8,500-sq.-mile Conorada tract borders the Delhi-Santos holdings on the north.

The 1 Innamincka, a deep wildcat drilling on the Delhi block, was drilling below 12,223 ft. last week. Cores taken between 12,067-88 ft. revealed a shale and sandstone, but no report on any oil shows was made. This test is one of the deepest ever drilled in Australia.

Both American and local Australian companies have interests in other Queensland concessions which cover the Great Artesian and Coastal basin areas. Participants include Plymouth Oil Co., Phillips Petroleum, Sunray Mid-Continent, Magellan Petroleum, and Australian American Oil Co.

Others are Associated Australian Oil Fields, Associated-Freney Oil Fields, Carpentaria Oils, Pty., Humber, Barrier Reef Oils, North West Oil, Papuan Aninaipi Petroleum, L. H. Smart Oil Exploration, Australian Oil & Gas, Gene Goff, Pty., and Lucky Strike Drilling.

Philippine Stepout Hits

A STEPOUT to a discovery in the Philippines has come in as a better producer than the first well.

Republic Resources Development Corp., a local Philippine company, said that its Reina Regente 1-A-X on Cebu Island came in with an indicated flow of 216 bbl. daily. The well encountered 20 ft. of productive sand at 1,700 ft.

This potential flow is three times better than the discovery, Reina Regente 1-A, which tested 72 bbl. daily from two shallow zones above 1,300 ft. The new well reportedly is located 50 ft. from the first test. The structure gives promise of becoming the country's first commercial field.

Islands Linked

. . . by crude line off Iran. Ganaweh section next.

THE FIRST 3-MILE PULL on a submarine pipeline in the Persian Gulf has been completed successfully by a foreign affiliate of Collins Construction Co.

The 30-in. line links Khargu and Kharg Islands, located offshore from Ganaweh, Iran. The company next will start a 19-mile pipeline pull to link Khargu Island with the mainland at Ganaweh.

When completed, the line will connect Gach Saran field in Iran to a new loading terminal now under construction on Kharg Island for Iranian Oil Exploration & Producing Co. (OGJ, Oct. 26, p. 66).

International Marine Constructors, C.A., a Collins affiliate, holds the contract for the submarine pipeline work. President S. V. (Sammy) Collins is personally directing the operation.

Collins is pulling the pipe in 4,000-ft. strings and using a giant Collins Seamaster winch with 1,320,000-lb. pulling capacity to do the job. The barge moves back on anchor cables after each string is pulled and welded. Water depths run to 150 ft.

The line consists of 22 miles in the water and 4 miles on Kharg and Khargu Islands. Williams Brothers, Tulsa, is building a 71-mile 26-28-in. line from Gach Saran overland to Ganaweh.

Australian Plant Slated

CONTRACT to build Australia's first synthetic-rubber plant has been awarded to Fluor International, S. A.

Fluor will build the 30,000-ton-annually plant at Altona, near Melbourne, for Australia Synthetic Rubber Co., jointly owned by Vacuum Oil Co., a Stanvac subsidiary, and Goodyear Tyre & Rubber Co. (Australia).

The plant is scheduled to begin production in 1961. Utah Australia, Ltd., a subsidiary of Utah Construction Co. of Salt Lake City, is associated with Fluor in the project.

The contract is a step in the development of a $50-million petrochemical complex. Other plants will produce ethylene and styrene.

Fluor and Utah also have the contract for the basic plant in the complex, a $28-million facility that will produce ethylene and butadiene from feed taken from Stanvac's Altona refinery.

Output Boost Seen

. . . for West Pakistan with development of Karsal.

AN OIL discovery in West Pakistan will make 800 to 1,000 bbl. daily on production, but the operating company has indicated the field itself may not be a large one.

Pakistan Petroleum, Ltd., operator for a joint venture in northern West Pakistan along with Pakistan Oilfields, Ltd., said that Karsal 3 is now capable of regularly producing from 800 to 1,000 bbl. daily as the result of two acid treatments.

More wells are planned for the structure. If two of them prove to be successful stepouts, Karsal field may be producing about 2,500 bbl. daily within a year or two. The forecast is based on a similarity between the Karsal structure and the structure of nearby Balkassar field.

While the new field may be comparatively small, it still promises to add a substantial increase to local Pakistani production of about 5,600 bbl. daily. Of four producing fields, Balkassar is the largest, yielding 2,744 bbl. daily from seven wells. Dhulian produces 2,693 bbl. daily from eight wells. Small amounts of crude are also produced from Joya Mair and Khaur fields, and from the upper horizon of Dhulian.

The new find is producing about 13% water along with 26°-gravity crude. The water is suspected of coming from a higher, exposed formation which can be blocked off.

Karsal will be placed on commercial production as soon as facilities can be built to move the oil to the 7,000-bbl.-daily Rawalpindi refinery, operated by Attock Oil Co., Pakistan Oilfield's parent firm. A pipeline link is planned to tie in with an existing line from Balkassar.

Siberian Plant Due Start

RUSSIA'S first major refinery in central Siberia is expected to go into limited operation by the end of the year.

The Angarsk plant is located on the Angara River near the city of Irkutsk. Crude supplies will initially be brought in by tank car from Russian Europe via the Trans-Siberia Railway. But by the end of next year, the plant will be fed by Russia's longest pipeline, a 2,300-mile 28-in. system originating at Ufa and the Tuimazy oil fields west of the Ural mountains.

Construction work has lagged behind schedule at the refinery, and the plant will not be on full production for several years. The official government newspaper, Izvestia, has criticized bottlenecks and complained of slow equipment deliveries and inefficient organization.

Haifa Will Export Products

ISRAEL'S BIG HAIFA refinery is going to process oil for export for the first time in 12 years.

An unidentified Western European company has reached a purchase agreement for 3 million barrels of products from the plant, which has operated at a fraction of its 87,000-bbl. capacity since the Israeli-Arab war.

A group of U. S. investors is negotiating possible investments in the plant for a modernization program. Runs to stills currently are averaging about 30,000 bbl. daily.

The refinery was purchased last year by Paz Oil Co. from Royal Dutch-Shell and British Petroleum. The firm is an Israeli marketing company that bought out local marketing facilities of the same two companies.

India Forces Cuts

. . . in products prices by three marketing firms.

COMPANIES marketing in India have made another price reduction in the face of pressure from the government.

Burmah - Shell, Standard - Vacuum, and Caltex, which supply a demand of about 150,000 bbl. daily, have agreed to reduce prices a total of $10.5 million a year. This is in addition to a $21-million reduction made last year.

The price cut, however, will be applied by the companies directly to the government's account. This is because the government considers the consuming public too large to reap any significant benefit from a reduction on this scale.

The new agreement will be in effect through 1960, when prices will again be reviewed.

Burmah-Shell has about 60% of the domestic market. Stanvac supplies about 25%, and Caltex, 15%.

FOREIGN BRIEFS . . .

The first Saharan well to be drilled by the French affiliate of British Petroleum is getting started in western Algeria. Ste. des Petroles de Valence staked a location on the 1,200-sq.-mile Djorf el Atfal permit after a long seismic survey.

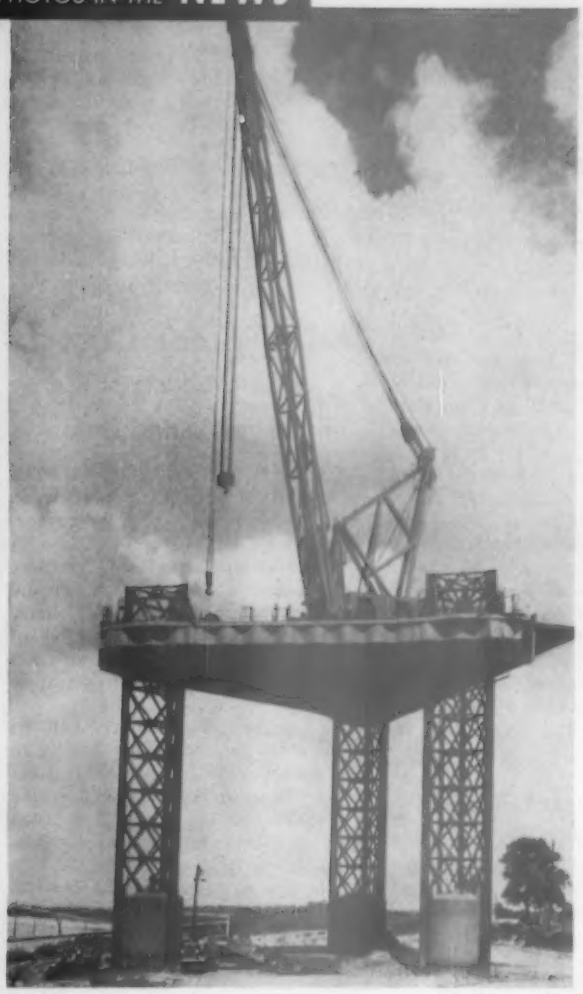
A prospecting permit covering 15,300 sq. miles in the Sahara Desert near Fort Flatters has been granted to Ste. des Petroles de Valence, the French affiliate of British Petroleum Co. Another permit for Algerian exploration was granted for SAFREP, on an area covering 1,730 sq. miles. The permit runs for 6 months.

Oil discoveries in eastern Libya have caused a renewed interest in the neighboring Western Desert of Egypt. Pan American International has obtained a permit to carry out a 2-month geological reconnaissance in a region of the Western Desert adjoining open Libyan acreage that has been sought by several companies. The area lies south of the concession given up last year by Sahara Petroleum Co.

A 1-year contract has been awarded to Century Geophysical Corp., Tulsa, for seismic operation in the Philippines. The firm will operate for San Jose Oil Co., Inc. Century has had four gravity crews in the islands for the past 2 years.

A new company, Kali-Chemie-Engelhard - Katalysatoren, G.m.b.H., Hanover, Germany, has been formed to produce and market platinum petroleum reforming catalysts in Europe, Middle East, and the Far East. It will produce Sinclair-Baker RD-150 and Atlantic-16, two platinum reforming catalysts. The firm was organized by Engelhard Industries, Inc., Newark, N. J., and Kali-Chemie, A. G. of Hanover, a producer of chemicals and catalysts.

Official French Government approval has been granted for a big-inch crude pipeline from Marseille to Strasbourg. Construction of the 460-mile 30-in., or possibly 32-in., system will start in January 1961. Sixteen companies are participating in the $100-million project, to be called South European Pipeline. An extension from Strasbourg to Karlsruhe, West Germany, also is planned.



Giant Bridge Builder

DWARFED by this huge bridge-building machine are the men on the deck and the big earthmover on the ground.

The 2,000-ton platform—built by R. G. LeTourneau, Inc., along the basic design of a mobile drilling platform—will be used to help erect a 6-mile concrete bridge across the northern neck of Lake Maracaibo.

The $1.5-million machine, now en route to Maracaibo, will move across the lake as the bridge goes up. When one section of the bridge is completed, the platform will lower itself to the water, raise its three legs from the floor of the lake, and then move to the next construction spot.

A giant crane on the deck will lift sections of concrete into place. The crane has a lifting capacity of 250 tons. The crane will be driven by seven electric motors, which receive power from dynamos driven by a battery of diesel engines with about 1,200 total horsepower. The crane will use more than 8,500 ft. of 1½-in. steel cable to lift the loads.

Scout's Nightmare

A MOVIE-style "private eye" would have a hard time finding out what's going on at Continental Oil Co.'s heavily-blanketed wildcat on the MGM film lot in Culver City, Calif.

Although the test is about as tight as a hole can get, there is speculation it has cinched a starring role among 1959 discoveries.

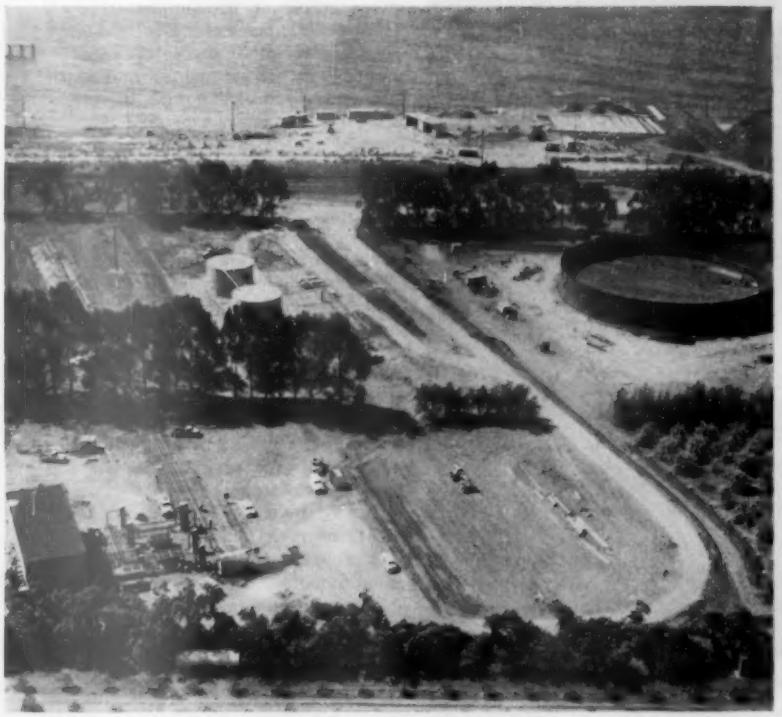
The company and MGM were neither confirming nor denying reports that the wildcat has encountered tremendous shows and thick oil sands. The promising formations reportedly are in the Sentous sands, which are productive in the Inglewood field 1 mile southeast.

A company geologist said the test is on a separate structure from the Inglewood where the Sentous sand is found at about 8,400 ft. Continental was drilling ahead below 10,257 ft. after setting 7-in. casing to 9,636 ft.

The area, where Continental has 800 acres under lease, is about 3 miles south of the prolific development on the 20th Century Fox movie lot in West Los Angeles. Continental's holdings also include the Desilu lot about ½ mile east of the MGM property.

End of an Era

RUSSELL B. BROWN and his wife accepted a portrait at the big banquet last week in Dallas honoring him for nearly 30 years as Washington spokesman for the Independent Petroleum Association of America. The testimonial banquet was a highlight of the IPAA annual meeting. Brown retires at year end after serving IPAA almost since it was formed.



Summerland Storage

CRUDE from wells drilled from a platform located 2.2 miles offshore is flowing to Standard Oil Co. of California's new onshore production facilities at Carpenteria, Calif. (Shown under construction here).

The facilities are linked to the platform by two 6-in. and one 8-in. pipelines. A 20-in. loading line is being built from the 217,000-bbl. onshore tank to an offshore tanker mooring.

In addition to the 217,000-bbl. storage tank, the facilities include two 5,000-bbl. tanks and gas-separation and compressing equipment.

Standard of California is operator for itself and Humble Oil & Refining Co. on the 5,500-acre Summerland offshore lease.

Fig. 1.

EACH SWITCH on this new feeder-control board represents a specific circuit breaker in the electrical system at Esso's Baton Rouge refinery. Operators have found that a . . .

Central control system

means better-controlled power flow

CABINETS which contain control room equipment were designed to simplify upkeep. Fig. 3.

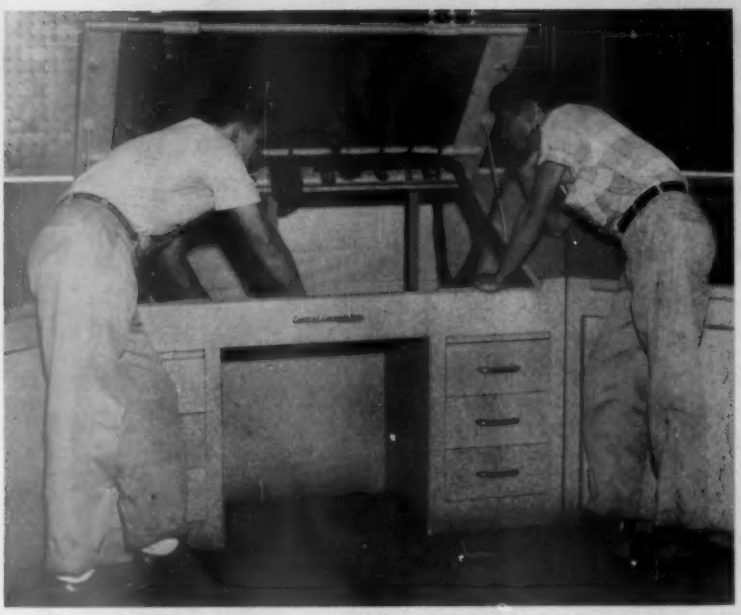
REDUCED UPKEEP, better operation, and faster restoration of power after an outage mark the operation of the new electrical control system at Esso Standard Oil Co.'s Baton Rouge refinery.

Unitil recently whenever a break in electric service occurred, one or more employes had to be removed from his regular assignment to check several places and pinpoint the trouble. Often this meant tedious and time-consuming checks before the right spot was found.

Now a more reliable controlled flow of power may be maintained to all units and facilities through the use of a central control system. This system is divided into three loops, each having its own dispatch center. The dispatch centers, housed in separate steel compartments, are served from one central control room.

The diagrams on the walls of the control center represent the electrical-distribution system of the refinery. Numerous small square symbols appear on the diagram ond each represents a specific circuit breaker. The immediate position of the breaker is indicated by a green light and a red light shows a closed one. A white light signals the existence of abnormal conditions.

When trouble occurs, such as a circuit breaker opening or closing without a corresponding adjustment in the central control room, the white light comes on, and an alarm bell rings in



SUPERVISORY ELECTRICAL CONTROL SYSTEM can be used to monitor by remote control any substation included in the system. Fig. 2.

the supervisory control center. This signal alerts the operator in the control center to a malfunction in the system and a quick glance at the wall diagram enables him to diagnose the trouble and take immediate steps to correct it.

Mounted on each of three consoles in the center is a control panel which enables the operator there to read instantaneously the electric current flowing through the main feeders in the distribution system.

All electrical substations at the refinery are now equipped with supervisory control equipment and in many of them the critical circuit breakers can be operated by remote control from the central unit.

This system allows the operator to have information immediately available which otherwise would have taken him a great deal of time and effort to obtain.

Unusual feature . . . The new unit is characterized by one very remarkable feature. The substations on each loop are connected to the control center by a telephone or control cable containing a single pair of wires. The same operations performed now by these two wires would have required several hundred in the past.

When the operator at the distribution center throws a control switch for a particular station, an electronic oscillator generates a unique combination of electriconic signals for which that station is coded.

This operation is similar to that which happens when a telephone number is dialed. You ring the telephone set which has been coded for the particular combination of numbers which you dialed.

The signals which go out from the dispatch center vary in frequency and units which are responsive to a particular frequency are set up at each substation along the loop. The units are coded to accept a single combination of signals, and they reject all others.

The signals are audible and actually have a musical quality. The musical notes are produced by a number of reeds similar to those found in a reed organ and are a part of the equipment in each dispatch center.

This intricate system of electronic controls performs three important functions in the electrical distribution system at the refinery: (1) line monitoring, (2) metering, and (3) remote control.

Line monitoring allows the operator to maintain a continuous check of the circuit breakers (open or closed) in the system. Remote metering shows the amount of electric current flowing through a particular circuit at any time. The main circuit breakers in the system are controlled by an electronic signal sent from the main control center and provide a means for remote control.

Esso reports its new system is already proving very useful and reliable for its designed purposes, and temporary spokesmen are hopeful that the future will bring still other important applications for this type of equipment.

DISPATCH CENTER is connected to control room by 1,800 wires, but only two wires are needed to carry signals from the dispatch center along the supervisory system loop which it serves. Fig. 4.

Here's a detailed description of a

Computer application to a gas-storage aquifer

The use of gas storage aquifers for supplying natural gas during periods of peak requirements is of increasing importance. It is expected that many such fields may be put into operation during the coming years. Knowledge of the performance of such storage reservoirs is essential to their proper design and operation.

BY DAVID CORNELL

. . . associate professor of chemical and mechanical engineering, Oklahoma State University. He has been engaged in teaching, writing, and research in the fields of gas-reservoir mechanics, phase behavior, engineering design, and electronic-computer applications for the last 7 years. Dr. Cornell's academic degrees were granted by University of Michigan. He has written several technical articles on gas-reservoir engineering and is one of the co-authors of the Handbook of Natural Gas Engineering, McGraw-Hill, 1959.

THE MOTION of gas and water in gas-storage fields has been studied by Katz, Vary, and Elenbaas[6] and Katz. Tek, and Coats[5]. These studies deal with unsteady-state aspects of gas and water-fluid mechanics. Behavior of the gas and water with complete gravity segregation was considered. Variations in saturation were not a part of these analyses.

The effect of water saturation on relative permeabilities of gas and water in a high permeability core was measured by Geffen et al[9]. Also, a detailed study of the displacement of gas by water in a long vertical core was made. These authors showed that the residual gas saturation after water displacement can be from 15 to 50% of the pore space. In this case the gas acts as a nonwetting phase and is about as difficult to displace from rock as oil ordinarily is.

Presented at the University of Michigan Research Conference on Underground Storage of Natural Gas, 1959.

Studies of the displacement of gas from unconsolidated sand were made by Root and Calhoun[8]. Such variables as flow rate and fluid properties were examined experimentally.

Displacement of water and gas in gas-storage aquifers depends upon the relative permeability of the gas and water at various degrees of water saturation. Such relative permeability data can be obtained experimentally in the laboratory using rather small core samples. Motion of the water and gas in the aquifer can then be calculated by the Buckley and Leverett method[1].

The calculation method presented by Welge[10] simplifies the Buckley and Leverett procedure considerably. The adaptation of this method to reservoir problems is often referred to as the frontal advance, or the fractional flow, calculation[2,7]. The theory of the method has been described previously and will not be repeated here.

Complexity of the frontal advance calculation depends on the number of variable reservoir conditions imposed; well-spacing geometry, nonhomogeneous rock, formation dip, and capillary effects may be considered. The purpose of this paper is to describe a procedure for handling the simplest case of frontal advance.

The linear-flow, homogeneous reservoir, horizontal formation case neglecting capillary effects will be considered. Many of the simplifying conditions may be removed when special field problems are involved.

Use is made of an IBM 650 computer with index registers and automatic floating decimal-point arithmetic. The programing method is that of "For Transit II[4]." While the details apply specifically to this type of computer, similar results can be obtained readily with other computers of various makes of comparable nature.

TABLE 1—DATA REQUIRED FOR FRONTAL ADVANCE CALCULATIONS

Computer Symbol	Engineering Symbol	Units	Description
RKP(I)	k_p	millidarcy	Relative permeability for the produced phase at a displacing phase saturation of I%.
RKD(I)	k_d	millidarcy	Relative permeability for the displacing phase at a displacing phase saturation of I%.
B	β	none	Formation volume factor for the gas phase at the reservoir conditions, cubic feet of reservoir gas per standard cubic foot of gas if gas is the produced phase and the reciprocal if gas is the injected phase.
VP	μ_p	centipoise	Viscosity of the produced phase.
VD	μ_d	centipoise	Viscosity of the displacing phase.
N	..	per cent	Displacing phase saturation at which RKD(I) = 0. N must be an integer.
M	..	per cent	Displacing phase saturation at which RKP(I) = 0. M must be an integer.

NOTE: Standard engineering symbols for saturation, viscosity, reservoir volume factor, etc., have been replaced because the computers used in this study would accept only capital letters of the English alphabet.

Data-Processing Block Diagram

Fig. 1 shows the basic steps in the

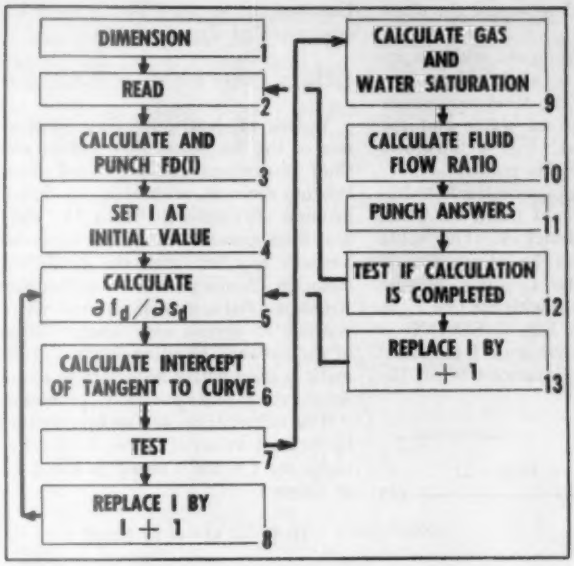
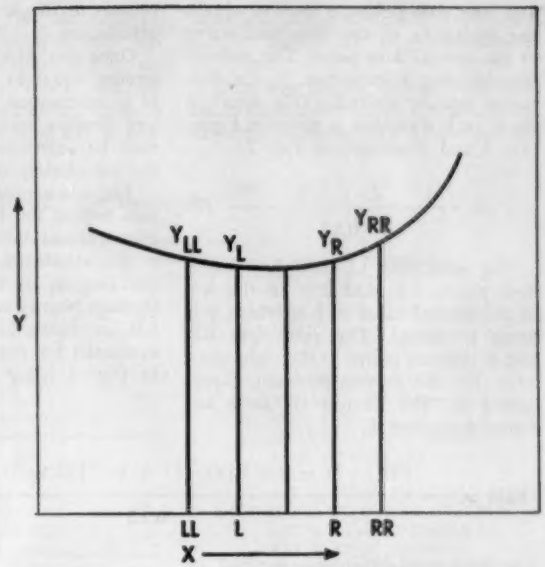


DIAGRAM of the steps followed in the calculations. Fig. 1.



VARIABLES in the numerical differentiation procedure. Fig. 2.

computer program. Block 1 is a dimension statement required to allocate space in memory for certain data and calculations. Block 2 is a group of read statements that cause the computer to read the data for a given problem.

Table 1 lists the types of input data. These include laboratory data on relative permeabilities for the displacing phase and the produced phase. These are tabulated for integral values of the displacing-phase saturation, S_d, denoted by the integer, I. Values of the produced-phase formation volume factor, B, and viscosity, VP, as well as the displacing phase viscosity, VD. are included. N is the integral value of I for zero relative permeability of the displacing phase, and M is the integral value of I at which the relative permeability of the produced phase is zero.

In block No. 3 the computer calculates values of the fractional flow function, f_d, according to Equation 1.

$$f_d = \frac{1}{1 + (k_p\mu_d / k_d\mu_p)} \qquad (1)$$

Equation 2 gives Equation 1 in symbols acceptable to the IBM 650 in "For Transit II."

$$\text{FD(I)} = \frac{1.0}{[1.0 + \text{RKP(I)}^*\text{VD} / \text{RKD(I)}^*\text{VP}]} \qquad (2)$$

At Block 4 the displacing-fluid saturation at which the calculations are to start is selected. A value of I = (N + 5) is convenient.

The values of fractional flow, f_d, are differentiated with respect to S_d in block No. 5. The derivative of the f_d versus S_d curve is obtained at S_d = I%. The central-difference method[9] involving a Taylor's series expansion

*The asterisk is the symbol used in the IBM 650 to indicate multiplication.

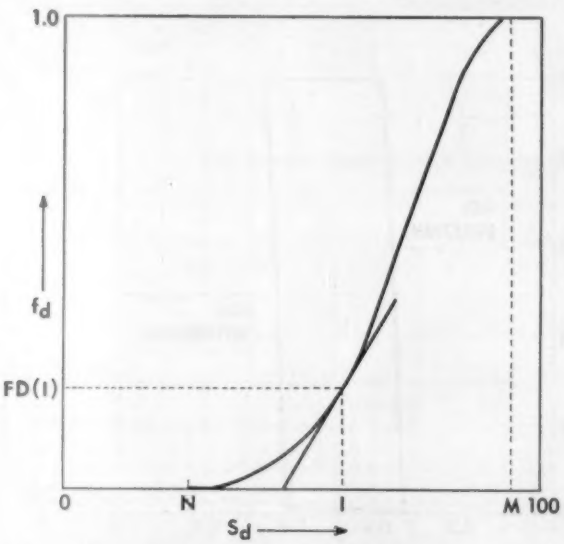
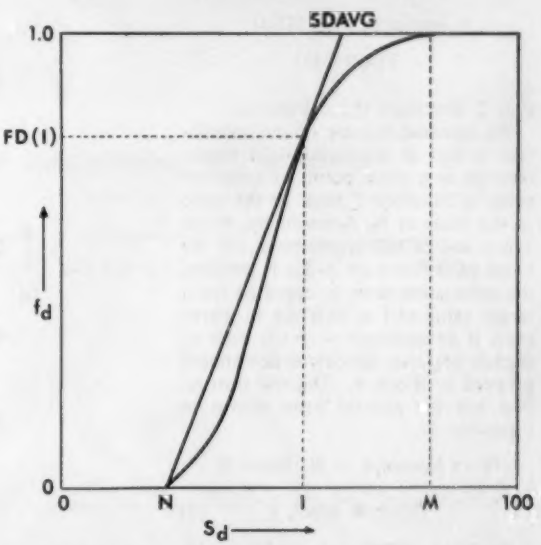


ILLUSTRATION of the tangent to the fractional flow curve before breakthrough. Fig. 3.



CONDITION at water breakthrough at a producing well. Fig. 4.

and four data points is used to obtain the derivative of the empirical curve at the central data point. The method for obtaining a derivative, y′, for data points equally spaced 1.0% apart in the x, or I, direction, is given in Equation 3 and illustrated in Fig. 2.

$$y' = \frac{y_{LL} - 8y_L + 8y_R - y_{RR}}{0.12} \quad (3)$$

The subscripts LL and L indicate data points 2% and 1% to the left of the central value of I at which y is being evaluated. The subscripts RR and R indicate points to the right similarly. For the present problem, Equation 3 in "For Transit II" form becomes Equation 4.

$$FD1 = \frac{FD(I-2) - 8.0*FD(I-1) + 8.0*FD(I+1) - FD(I+2)}{0.12} \quad (4)$$

The backward-difference method of differentiation might seem more logical to use, but it was tried and found to give erroneous results near the sharp bends in the fractional flow curve.

The next step in the calculation procedure is to draw a tangent to the f_d versus S_d curve at $S_d = 1\%$. The point-slope formula for a straight line is used for this purpose.

$$(y - y_1) = m(x - x_1) \quad (5)$$

The point involved is $y_1 = FD(I)$ and $x_1 = I$. The slope, m, is FD1 from Equation 4. The calculation is indicated in block No. 6. The intersection of the line tangent to the f_d curve with the S_d axis is then found for $f_d = 0$.

$$x = x_1 - (y_1/m) \quad (6)$$

or

$$x \text{ intercept} = (I/100.0) - FD(I)/FD1 \quad (7)$$

Fig. 3 illustrates the calculation.

An essential feature of the calculation is that at displacing-fluid breakthrough at a given point the intercept value in Equation 7 must be the same as the value of N. Accordingly, Block 7 is a test of this requirement. If the value of (x intercept − N) is positive, the calculation must be repeated for a larger value of I as in Block 8. However, if (x intercept − N) is zero or slightly negative, the calculation should proceed to Block 9. The test instruction has the general form shown in Equation 8.

IF (x intercept − N) Block 9,

Block 9, Block 8 (8)

In Block 8 the value of I is increased by 1. The calculation then returns to Block 5 to repeat the slope calculation.

Once the first tangent with an intercept equal to or slightly less than N is determined, the fluid saturations and flowing ratios of water and gas may be calculated. Fig. 4 illustrates the calculation at this point.

The average displacing-fluid saturation behind the flood front, SDAVG, is calculated in Block 9. The value of this saturation is the intersection of the tangent to the f_d curve passing through N at $f_d = 0$ with the line, $f_d = 1.0$, as shown on Fig. 4. SDAVG is evaluated for the value of I indicated in Fig. 4 using Equations 9 or 10.

$$x = x_1 + (I - y_1)/m \quad (9)$$

$$SDAVG = I/100.0 + [1.0 - FD(I)]/FD1 \quad (10)$$

The average produced fluid saturation, SPAVG, may be calculated from SDAVG using Equation 11.

$$SPAVG = 1.0 - SDAVG \quad (11)$$

In Block 10 the instantaneous ratio of volume of displacing fluid to produced fluid, DPR, passing a certain point after break-through of the front past the point is calculated. Equation 12 is used.

$$DPR = f_d B/(1 - f_d) \quad (12)$$

Equation 13 is the "For Transit II" equivalent of Equation 12.

$$DPR = FD(I)*B/[1.0 - FD(I)] \quad (13)$$

Values of fractional flow, derivative of the fractional flow curve, and fluid saturations are converted from floating-decimal arithmetic to fixed-decimal arithmetic in Block 11. They are then punched out on cards as answers together with the fluid-flow ratio in floating-decimal arithmetic. Fixed-decimal arithmetic is used where possible to permit easy interpretation of the answers. Floating-decimal arithmetic is used where necessary to avoid data-scaling and overflow problems.

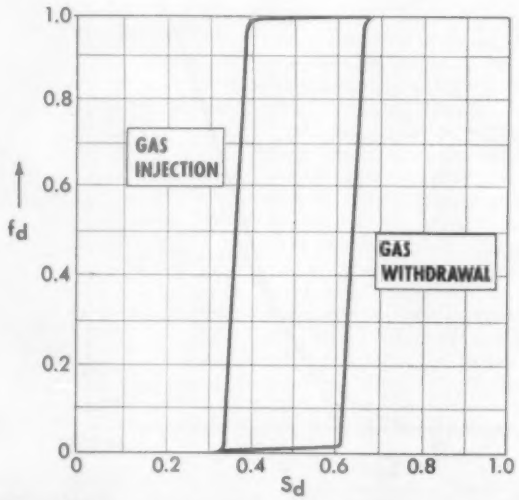
The calculations are to be repeated up to an I value of M − 1. Accordingly, the I value is tested in Block 12 as follows:

IF (I − M + 1) Block 13,

Block 2, Block 2 (14)

Equation 14 says that if I is less than (M − 1) the value of I is to be increased by 1 in Block 13, and the entire calculation is to be repeated for production after breakthrough. If I is equal to or greater than (M − 1), the problem has been completed. The computer then returns to the read block to begin another problem.

"For Transit II" program . . . A complete listing of the "For Transit II" statements to accomplish the calculations shown in the block diagram is given in Table 2. Machine-language program may be obtained from this data for the specific computer installation to be used.



FRACTIONAL flow curves for example problem. Fig. 5.

Data for an Example Problem

Two types of data cards are required. The first is a single card containing values of N, M, viscosity of the produced phase, viscosity of the injected phase, and formation volume factor for the gas. The second type contains the relative permeability values for each integral value of displacing fluid saturation. There will be (M − N + 1) of such cards. Table 3 shows a data-card listing for a gas-injection problem. Table 4 shows a similar listing for a gas-withdrawal problem.

Data for the two cases have been taken from the work of Geffen, et al[3]. Relative permeabilities are for gas and

Table 2—"For Transit II" Statements

Statement Number	Continuation Number	Statement
0 0001	0	DIMENSION RKD(100), RK
0 0001	1	P(100), FD(102)
0 0002	0	READ, N, M, VP, VD, B
0 0003	0	DO 4 I = N, M
0 0004	0	READ, RKD(I), RKP(I)
0 0005	0	DO 6 I = 1, N
0 0006	0	FD(I) = 0.0
0 0007	0	K = N + 1
0 0008	0	L = M − 1
0 0009	0	DO 13 I = K, L
0 0010	0	FD(I) = 1.0/(1.0 +
0 0010	1	RKP(I)*VD/RKD(I)*V
0 0010	2	P))
0 0011	0	KA = FD(I)*10000.0
0 0012	0	PUNCH, I, KA
0 0013	0	CONTINUE
0 0014	0	DO 15 I = M, 100
0 0015	0	FD(I) = 1.0
0 0016	0	I = N + 5
0 0017	0	FD1 = (FD(I−2) − 8.0*FD(
0 0017	1	I−1) + 8.0*FD(I+1) − FD(
0 0017	2	I+2))/0.12
0 0018	0	A = (I−N)/100.0 − FD(I)/
0 0018	1	FD1
0 0019	0	1F(A) 22, 22, 20
0 0020	0	I = I + 1
0 0021	0	GO TO 17
0 0022	0	SDAVG = I/100.0 + (1.0−F
0 0022	1	D(I))/FD1
0 0023	0	SPAVG = 1.0 − SDAVG
0 0024	0	DPR = FD(I) *B/(1.0−FD(
0 0024	1	I))
0 0026	0	KA = FD(I)*10000.0
0 0027	0	KB = FD1*10000.0
0 0028	0	KC = SDAVG*10000.0
0 0029	0	KD = SPAVG*10000.0
0 0032	0	PUNCH, I, KA, KB, KC, KD,
0 0032	1	DPR
0 0033	0	IF(I−M+1) 34, 2, 2
0 0034	0	I = I + 1
0 0035	0	GO TO 17
0 0036	0	END

Table 3—Data-Card Listing for Gas-Injection Problem

N	M	VP	VD	B
32	0000000072	6800000050	1300000049	7500000052

RKD(I)	RKP(I)
	1400000052
1000000048	1230000052
3000000048	1080000052
7700000052	1000000050
7950000052	5000000049
8200000052	0000000000

Table 4—Data-Card Listing for Gas-Withdrawal Problem

N	M	VP	VD	B
28	0000000068	1300000049	6800000050	1333000049

RKD(I)	RKP(I)
	8200000052
5000000049	7950000052
1000000050	7700000052
1500000050	7470000052
1080000052	3000000048
1230000052	1000000048
1400000052	0000000000

Table 5—Answer-Card Listing for Gas-Injection Problem

I	f_d	$\partial f_d / \partial S_d$	Average Gas Saturation Behind Front, %	Average Water Saturation Behind Front, %	Flow Ratio, SCF Gas/cu ft water
33	0000000042	0000000000	0000000000		
34	0000000143	0000000000	0000000000		
35	0000000417	0000000000	0000000000		
36	0000000854	0000000000	0000000000		
37	0000003643	0000000000	0000000000		
38	0000008940	0000000000	0000000000		
39	0000009840	0000011942	0000004033	5966	4615373154
40	0000009905	0000000000	0000000000		
41	0000009930	0000001769	0000004492	5507	1073690255
42	0000009946	0000001285	0000004616	5383	1394893355
69	0000009999	0000000012	0000007197	2802	1953050057
70	0000009999	0000000013	0000007187	2812	3024118557
71	0000009999	0000000013	0000007190	2810	6249925057

water in a 590 md. sandstone having 26.5% porosity. These values represent typical gas-storage aquifer conditions.

Relative permeability for gas was 0 at 68% water saturation. Relative permeability for water was 0 at 38% water saturation. Viscosity of gas was assumed to be 0.013 cp. and the viscosity of water 0.68 cp. for the purpose of the problem. The factor B was assumed to be 75 standard cubic foot/1 cubic foot for gas injection and the reciprocal for gas withdrawal.

Only a very few relative-permeability data points were available. Intermediate values were estimated. The values of relative permeability that approach 0 are of very critical importance in the calculation. It was necessary to assume values of these permeabilities. In the absence of detailed laboratory data, calculations based on such assumptions can only be considered as approximate.

Calculated Results for Example Problem

The data given in Tables 3 and 4 were processed using the computer program. Results for gas injection are given in Table 5 and for gas withdrawal in Table 6. Fig. 5 shows the fratcional flow curve that can be drawn from the values of f_d calculated in the first part of computer program.

During gas injection into an aquifer initially saturated with water the average gas saturation behind the front will be 40.33% of the pore space for the portion of the reservoir that has received gas. Saturation at the front will be 39%, f_d has a value of 0.9840, and the slope of the fractional flow curve is 1.1942. Other values in Table 5 are difficult to interpret since no production from the reservoir is involved.

Gas withdrawal has been considered as a separate problem from the gas injection. That is, the reservoir was assumed to be filled with gas at the start of gas withdrawal rather than having the gas saturation existing at the end of the injection period. Results are given in Table 5 for a gas saturation of 100% initially. Necessary modifications to the calculations to permit other initial gas saturations have been described[7] but are not taken up here.

For water displacement of gas from the reservoir, a gas saturation of 32.30% remains in the wateredout zone at the time of breakthrough, and a very high water-gas producing ratio develops. Further production from the wells reduces the gas saturation only slightly. Irregularities in the calculations in Table 5 are due to the man-

Nomenclature

B — Formation volume factor for the gas, cubic foot/standard cubic foot if gas is the produced phase and standard cubic foot/cubic foot if gas is the injected phase
DPR — Cubic foot water/standard cubic foot gas produced on gas withdrawal or standard cubic foot gas/cubic foot water flowing on gas injection
f_d — fractional flow of displacing phase, dimensionless
FD(I) — For Transit symbol for f_d at a displacing phase saturation of 1%
FD1 — "For Transit" symbol for $\partial f_d / \partial S_d$
I — "For Transit" symbol for S_d
k_d, k_p — relative permeability of formation to displacing and produced phases, millidarcy or per cent
KA, KB, KC, KD, L — "For Transit" fixed-decimal variables
M — displacing-phase saturation at which $k_d = 0$
m — slope
N — displacing-phase saturation at which $k_p = 0$
RKP(I), RKD(I) — "For Transit" symbols for k_p and k_d
S_d — displacing-phase saturation, per cent
SDAVG, SPAVG — average displacing or produced-phase saturation behind the front, per cent
VP, VD — "For Transit" symbols for μ_p, μ_d
μ_p, μ_d — viscosity of produced and displacing phases, centipoise

Table 6—Answer-Card Listing for Gas-Withdrawal Problem

I	f_d	$\partial f_d / \partial S_d$	Average Water Saturation Behind Front, %	Average Gas Saturation Behind Front, %	Flow Ratio, cu ft Water/SCF Gas
29	0000000000	00			
30	0000000000	00			
31	0000000000	00			
32	0000000000	00			
33	0000000000	00			
34	0000000001	0000000000	0000000000		
35	0000000001	0000000000	0000000000		
63	0000006356	0000000000	0000000000		
64	0000009145	0000000000	0000000000		
65	0000009582	0000017392	0000006740	3259	3058062050
66	0000009856	0000017903	0000006679	3320	9174189250
67	0000009957	0000006067	0000006769	3230	3134472751

ner in which the relative permeability data were assumed and not to the calculation procedure.

Conclusions

The frontal advance calculation for displacement of gas and water in gas-storage aquifers has been programed for solution using a digital computer. By this means gas and water saturations and ratios of flow rates of gas and water may be calculated. Advantages of the computer solution are rapidity and accuracy of the computations. Application to an elementary problem in gas-storage aquifer fluid mechanics has been made.

Acknowledgments

Permission of the Continental Oil Co. to present the frontal advance computer solution in this adaptation is gratefully acknowledged. The work of adapting the solution to gas-storage aquifers was done under an E. I. du Pont de Nemours & Co. research grant in chemical engineering. Use of the numerical differentiation procedure was suggested by E. G. Woods. The assistance of J. D. Helmert in carrying out the computer operations while in the National Science Foundation Research Participation Program was particularly helpful.

References

1. Buckley, S. E. and Leverett, M. C., "Mechanism of Fluid Displacement in Sands," Trans. AIME, 142, 152 1942.

2. Calhoun, J. C., "Fundamentals of Reservoir Engineering," University of Oklahoma Press 1953.

3. Geffen, T. M., Parrish, D. R., Haynes, G. W., and Morse, R. A., "Efficiency of Gas Displacement from Porous Media by Liquid Flooding," Trans. AIME, 195, 29 1952.

4. International Business Machines Corp. Programer's Reference Manual—FORTRANSIT (Revised) IBM Applied Programming Dept. 1957.

5. Katz, D. L., Tek, M. R., and Coats, K. H., "The Effect of Unsteady State Aquifer Motion on the Size of an Adjacent Gas Storage Reservoir," Paper 1114-G, AIME, 1958.

6. Katz, D. L., Vary, J. A., and Elenbaas, J. R., "Design of Gas-Storage Fields," Paper 1059-G, AIME, 1958.

7. Pirson, S. J., "Oil Reservoir Engineering," McGraw-Hill Book Co., Inc. 1958.

8. Root, P. J., and Calhoun, J. C., Jr., "Displacement of Gas by Water From Unconsolidated Sands," Producers Monthly, 18, No. 10, 18 August 1954.

9. Salvadori, M. G., and Baron, M. L., "Numerical Methods in Engineering," Prentice-Hall, Inc. 1952.

10. Welge, H. J., "A Simplified Method for Computing Oil Recovery by Gas or Water Drive," Trans. AIME, 195, 91 1952.

Nelson Refinery Cost Indexes

Published in the first issue each month in the Engineering Section.

Compiled by W. L. Nelson, Petroleum Refinery Consultant, Tulsa.

Charts of the indexes are published each year in a late January or early February issue.

Indexes of selected individual items of equipment and materials are also published on the Costimating page in the first issue of the month of January, April, July, and October.

Refinery Construction Cost Index (1946 Basis):

Explained on page 101 of the issue of August 5, 1957.

	1950	1954	1956	1957	1958	July 1959
Pumps, compressors, etc.	138.2	166.5	192.0	206.7	214.7	226.5
Electrical machinery	134.9	160.0	175.0	188.9	192.7	198.0
Internal-combustion engines	126.0	150.5	164.0	173.9	178.3	179.0
Instruments	127.8	154.6	182.1	187.4	194.9	204.1
Heat exchangers	140.0	171.7	190.7	203.6	181.2	177.1
Misc. equipment average	126.2*	160.7	180.5	192.1	192.4	196.9
Materials component	149.5	174.6	190.4	201.9	204.2	207.8
Labor component	144.0	183.3	198.2	208.6	220.4	233.9
Nelson construction index	146.2	179.8	195.3	205.9	213.9	223.5

Refinery Operating Cost Indexes (1956 Basis):

Explained on page 171 of the issue of June 1, 1959.

	1946	1952	1954	1957	1958	May 1959
Fuel cost	49.6	81.0	86.5	112.4	102.6	105.1
Labor cost	73.1	88.7	90.9	106.1	105.0	107.0
Wages	52.4	81.5	88.7	104.1	105.4	112.2
Productivity	68.3	90.2	97.1	98.1	100.3	104.9
Investment, Maintenance, etc.	51.2	83.6	92.0	105.4	109.5	112.6
Chemicals cost	37.0	72.1	85.7	102.2	104.4	104.9
Operating Cost Indexes:						
Refinery	58.5	80.5	88.7	106.4	105.9	108.1
Process Units†	62.9	82.2	88.4	107.1	105.8	108.3

*Used in computing the Nelson Index until April 1952.

†Add chemical costs separately.

BY W. L. NELSON
Technical Editor and Petroleum Consultant

Waxy crudes are scarce

Your answers of December 16, 1957, and November 17, 1958, have been useful in studying geologic conditions associated with the occurrence of waxy oils. Can you please list fields that have produced oils of high wax content? J.B.

One must first define oils of high wax content. The term is used herein to mean an oil that contains a large amount of wax in the wax-bearing portion (above about 700° F. boiling point), which means that a high API gravity oil of high wax content may contain only a small percentage of wax based on crude oil, or conversely, a low wax-content oil of low API gravity may contain a relatively large percentage of wax even though it is classed as a low-wax oil.

Pour point of the crude oil is of little usefulness because of high API gravity oils the large amounts of gasoline and distillate portions are an effective solvent for the wax. Likewise, the cloud points of the distillate and lube fractions mean little because even a small amount of wax can cause a high cloud point.

Finally, how much wax is a large amount of wax? Forty per cent has been used herein as a high wax content.

In other answers to Questions on Technology, the difference in the characterization factors at 750° F. and at 550° F. has been used as a means of estimating the amount of wax in the 700°-900° F. boiling range (paraffin or wax distillate) fraction of a crude oil. For fixed boiling points such as the 550° and 750° F. (or any other fixed temperature) the relationship can be stated simply in terms of specific gravity and thus the customary Hempel analyses of the U. S. Bureau of Mines can be used to estimate wax content. The relationship between specific gravities and wax content is indicated in Fig. 1.

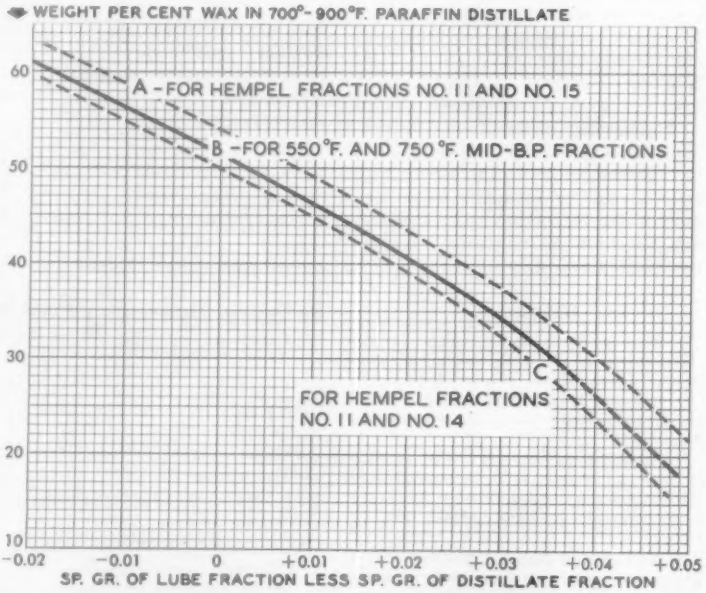
The 470 crude oils presented in Reports of Investigations 5376 of the U. S. Bureau of Mines (McKinney and Garton, "Analyses of Crude Oils from 470 Important Oil Fields . . ."), have been examined

TABLE 1—WAXY CRUDE OILS

Name—	API	Specific gravity, 60/60 Fraction 11	Fraction 14	Fraction 15	Approx. wt. % wax in paraffin distillate	Pour point of crude oil, °F.
Conroe, Tex.*	37.8	*0.867	0.881	0.888	42-44	10
White Lake (East), La.	36.2	*0.861	0.879	0.885	40-42	
Charenton, La.	36.0	0.852	0.871	0.879	39-40	
Fordoche, La.	40.6	0.849	0.867	0.875	40	45
Gibson, La.	37.4	0.842	0.860	0.868	40	
Cement, Okla.	31.0	0.850	0.869	0.877	39-40	

Venezuela:	API	550° F. fraction	750° F. fraction	Approx. wt. % wax in paraffin distillate	Pour point of crude oil, °F.
Mata, Anzoat.	31.3	0.860	0.859	51	46
Ruiz, Guarico	32.4	0.860	0.884	38	59
Mapiri, Anzoat.	33.3	0.862	0.875	44.5	90
Santa Ana, Anzoat.	34.2	0.856	0.858	50	90
Mapiri Este, Anzoat.*	35.1	*0.867	0.865	52	105
Saban, Guarico	37.2	0.852	0.855	50	80
La Ceiba, Anzoat.	36.6	0.857	0.872	43	70
San Joaquin, Anzoat.	38.4	0.857	0.862	49	90
Taman, Guarico	38.4	0.840	0.842	50	100
Quiamare, Anzoat.*	37.8	*0.868	0.873	49	75
Dakoa, Guarico	39.3	0.838	0.858	40	82
San Roque, Anzoat.	39.0	0.854	0.862	48	90
Rincon, Anzoat.	39.3	0.865	0.858	55	80
El Toco, Anzoat.	39.9	0.860	0.832	over 61	122
Guario, Anzoat.	40.8	0.858	0.855	53	122
Anaco, wax, Anzoat.	43.7	0.860	0.849	57	72
San Joaquin, Anzoat.	44.2	0.850	0.859	47	80
Santa Rosa, Anzoat.	45.0	0.853	0.861	47	81
El Roble, Anzoat.	54.6	0.850	0.869	41	low
Talang Akar, Indonesia	36.5	0.847	0.865	42	80
Gunung Kemala, Indonesia	38.0	0.852	0.880	36	85
Gwinville, Mississippi	39.9	0.825	0.848	38	50
Bahia, Brazil	39.6	0.806	0.838	33	75
Magallanes, Chile	41.9	0.841	0.865	38	

*The method should not be applied if the 550° F. midboiling-point fraction has a specific gravity higher than about 0.865 because such naphthenic oils contain little or no wax.



ESTIMATING the approximate amount of wax in paraffin distillates from specific gravity 60/60. Fig. 1.

and only the six oils shown at the top of Table 1 qualify as high-wax-content oils, and two of these are so naphthenic (Conroe and White Lake) that they probably contain less wax than indicated by the method used herein. The wax content of a few other oils (from other sources than RI 5376) are shown in the lower part of Table 1.

Note especially that the method developed here cannot be applied to naphthenic crude oils that contain little or no wax. The specific gravities of the 550° F. fractions of such oils are higher than about 0.865.

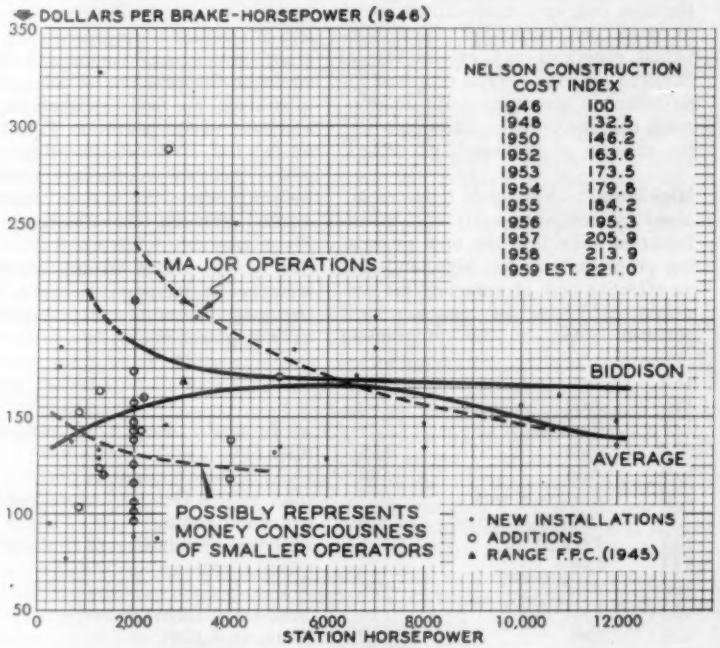
The thousands of Hempel crude-oil analyses of the U. S. Bureau of Mines can be examined for the approximate amount of wax in them (the paraffin distillate fraction) by simply noting the specific gravities of Fractions 11, 14, and 15 and using these specific gravities with Fig. 1.

Gas-compressor-station costs brought up to date

Have you more recent data on compressor-station costs than those shown in your Costimating No. 22 of December 1956? R. T. S.

Excellent data were published recently by Reed and Kinney in the Journal issue of July 13, 1959, p. 100. These data have been analyzed in Fig. 1 and also shown is the Biddison equation (OGJ, May 14, 1931, p. 25) which states the cost (1946) as $55,000 plus $160 for each horsepower. Additions appear to cost almost as much as new installations and this is logical because the compressors constitute the main cost. There is a tendency for very small installations to cost less than the average and this may be due to the cost consciousness of the operators of small installations. The range of costs used by the Federal Power Commission (1945) are shown as solid triangle points.

The construction costs were converted from their dates of construction to 1946 by use of the Nelson Refinery Construction Cost Index (each month in The Oil and Gas Journal).



APPROXIMATE COST (1946) of compressor stations. Fig. 1.

Labor cost of vessels

In connection with estimating the cost of vessels, we are confused about whether labor is or is not included in your Costimating No. 5 (Jan. 23, 1956, similar to No. 9 of Dec. 16, 1948). C. L. T.

At least three kinds of labor-costs situations are included in Costimating No. 5. Somewhat detailed cost information for installed flanged nozzles, handholes, and manholes is given. These costs along with the cost of the shell and heads (based on weight), constitute the fabricated cost of a vessel. The word "installed" used in connection with the flanged connections means installed in the fabricated vessel.

Next, the fabricated vessel needs to be erected or set into position at the construction job and thus an erection cost must be included. Such vessels are often priced on a pound basis without connections, and little or no cost need be added for labor except for erection and for very minor field labor. Obviously the addition of connections involves labor but in Costimating No. 5, the labor cost of installing nozzles, etc., is included in the installed cost. Fabricated vessels, including connections, are also priced on a per pound basis and if so, nothing more than a labor cost for erection is necessary.

It is also necessary to distinguish between fabricated vessels that are built and shipped from boiler shops, and field-fabricated vessels (or more frequently tanks) that are built from sheet plate and various connections in the field because they are too large to be transported.

In such a construction operation, the cost of the basic steel and various connections is relatively small, but the cost of the labor involved in shaping, handling, and welding the parts into a finished vessel is relatively large. The cost of erection must also be added to the cost of the field-fabricated vessel.

Unfortunately, most of those who have published cost information (the data underlying Costimating No. 5, etc.) do not and probably cannot describe exactly what is included in their costs. To the layman this may seem strange but the layman does not realize the difficulties encountered in obtaining dependable cost data from construction men. Only under the most favorable shop conditions can precise cost information be obtained.

Automatic programing:

It can help cut computer operating costs

Automatic programing is a rapidly developing field. Continuing work on the part of many groups is helping to overcome many of the limitations associated with computer usage and bringing about a more effective and complete use of its ability. By letting the computer itself do much of the costly and time-consuming labor needed before a problem is ready for running on the computer, work is accelerated on the many pressing research and operating problems in the refining industry and in all industry which are urgently awaiting computer solution.

BY THOMAS S. GRIER
Univac Petroleum Marketing Specialist,
Remington Rand Division of
Sperry Rand Corp.

IN ARRIVING at the decision to acquire an electronic computer, management studies carefully the savings anticipated by using the computer to perform jobs which are either being done by some other means or are not being done at all because of their complexity. Against this estimate of savings is weighed the cost associated with the computer.

These costs, inherent in any computer operation, comprise three basic categories:

1. The one-time investment in site preparation and installation.
2. The monthly computer rental or depreciation charge and operating costs.
3. The continuing cost of developing and maintaining programs for the computer.

Each of these categories represents, in itself, a substantial item. Rental or depreciation charges are, quite obviously, the largest of the three. However, installation and programing costs are presently both substantial, but they represent areas in which reductions are being effected. Installation charges and the cost of site preparation for example, can represent an outlay ranging from $30,000 to $100,000 or more for some of the large vacuum-tube computers available today.

With the advent of transistors and other solid-state elements, computers are evolving into smaller, lighter units than before, with a corresponding reduction in power requirements and in heat dissipation. Because of these advances, the cost of installing these newer solid-state computers is no longer the significant item that it once was.

Developing program . . . Since the days of the early computers, the job of developing the program has been a costly one. A rapidly developing field, that of automatic programing, is permitting today's computer user to write his programs at a greatly reduced cost and by an amazingly simple technique, namely, letting the computer itself do part of the programing tasks.

Programs, of course, represent the detailed instructions which tell the computer how to perform any given job. They are written in a unique code which the computer understands. The fact that it is a unique code adds to the difficulty, and to the costs; because it is generally true that the programs written for any one computer cannot be run on any other computer.

Professional programers, the individuals who are equipped to write these lengthy instruction lists, are sometimes hard to find, and they are expensive to train. Because programing calls for a high degree of precise and orderly thinking, even the best programers make mistakes. These must be detected and then corrected, a process known rather logically as "debugging."

By the time a program has been written, checked out, and corrected, the cost can very easily climb to $5 or more per instruction. Since individual programs can exceed several hundred, or even several thousand instructions in length, program development can represent an annual cost to the refiners of thousands of dollars.

High costs . . . Very early it was recognized by computer users and manufacturers alike that the cost of writing programs was too high, and that an effective way of reducing this cost would be to have the computer itself perform some of the programing tasks which had previously been done by hand. From this concept, then, have emerged the various assembly systems, interpreters, and compilers which are today classed as automatic programing techniques.

For years people struggled to teach individuals to understand computers. Automatic programing reverses this procedure and teaches the computer to understand people.

To understand more about the function of automatic programing systems, let us consider first the problem of machine coding, or writing programs in computer language. Suppose we have the problem of adding 100 quantities, Y_1, to 100 quantities, X_1, and storing the results as Z_1's. First, let the 100 X's be stored in the computer memory locations numbered 800-899; the 100 Y's in locations 1,200-1,299; and the 100 results, or Z's in locations 1,529-1,628. With the instructions placed in the computer memory beginning at location 115, the program (written for a hypothetical computer) might be:

115	Get	800	X_0
116	Add	1,200	$+Y_0$
117	Park at	1,529	$= Z_0$ to Z_0
118	Get	115	(Get 800)
119	Add	586	(+1) (a "one" stored at 586)
120	Compare with	587	(Get 899) ("Get 899" stored at 587)
121	If greater, go to	XXX	exit from routine
122	Park at	115	otherwise, send (Get 801) to 115
123	Get	116	(Add 1,200)
124	Add	586	+1
125	Park at	116	Send (Add 1,201) to 116
126	Get	117	(Park at 1,529)
127	Add	586	+1
128	Park at	117	Send (Park at 1,530) to 117
129	Jump to	115	

This hypothetical program is called a "fixed subroutine." It is not only written in computer code, but it also refers to fixed storage locations. This presents no problem for the short program considered here. But what would be involved if the program were a lengthy one, perhaps including hundreds or thousands of program steps? In the first place, only one programer could do the job, for only he would know where in the computer memory he had placed the essential elements of the program. This increases the length of time required to do the programing job. It also increases the possibility of errors.

Relative coding . . . To alleviate these shortcomings, then, why not code the problem in a system of relative notation? For example, let us look at the previous problem and stipulate that the X's will be in locations A, A + 1, A + 2, etc., the Y's in consecutive locations beginning with B, and the Z's, with C. A, A + 1, B, B + 1, C, and C + 1 are not computer memory addresses. They are relative designations denoting memory locations. Before a program written in this manner could be run on a computer, some actual memory - location addresses would have to be substituted.

Following this system of programing has definite advantages. The programing task can be subdivided so that each of several individuals is working on a section of the program. This reduces both the time required and the frequency of errors. To assemble these sections and allocate storage, a master assembly routine is written and the computer itself does the job. In other words, the relatively coded program sections and the assembly routine are both given to the computer, which then produces a running machine-coded program which has been properly optimized to reduce latency time if this is required.

This typical assembly system represents one of the automatic programing techniques which is available to computer users today. More powerful systems, however, have been and are being developed.

Consider the frequency with which certain subroutines appear in computer-coded problems. From an engineering standpoint, for example, common mathematical functions such as sine, cosine, and square-root calculations certainly represent frequently used subroutines. By incorporating these in a library of relatively coded programs, and by developing a "pseudocode" to indicate which of the subroutines is being called from the library, the computer can be used to interpret the pseudocode, select designated subroutines from the library, allocate both data and instruction storage and finally assemble them into a complete program.

"Initial attempts at developing a data-processing compiler revealed several serious problems."

Algebraic compilers . . . The master routine which directs the computer in accomplishing this has come to be called a compiler.

The compiler, through its use of a pseudocode, has reduced the amount of coding to be written by a factor of 20 or more. At the same time, the possibility of making mistakes has been reduced by an even larger factor. One of the big cost-saving benefits, however, has been the compiler's comparative simplicity and the relative ease with which engineers, and others who originate the problems can be taught the pseudocode.

As early as 1953, work was being done by a group at MIT to produce a pseudocode more nearly resembling normal mathematical statements than did any of those then in existence. Their program, which was developed for the MIT "Whirlwind I" computer, was followed in 1956 by the Math-Matic compiler for UNIVAC I and II, in 1957 by Fortran for the IBM 704 and, presently, by Unicode for UNIVAC 1103A.

These algebraic compilers represent a significant forward step, and the engineer who has a digital computer at his disposal now has the means of describing his problem in a simple pseudocode which the computer can translate. In effect, he is writing his own programs in a short time and without having taken extensive training courses.

Consider, for example, this small problem:

Solve:

$$Y = [X^3 (2 + X)/3 \cos A] - P$$

for P running from 0.2 to 0.8 in increments of 0.2, A going from 0.35 to 1.05 in increments of 0.175 and X varying from 1.8 to 3.8 in increments of 0.5.

To write a machine-coded program to perform this computation on the UNIVAC would require several hundred individual instructions. However, when this same problem is coded in the Math-Matic compiler system, it consists of six logical, understandable sentences:

(1) VARY P 0.2 (0.2) 0.8 SENTENCES 2 THRU 5.

(2) VARY A 0.35 (.175) 1.05 SENTENCES 3 THRU 5.

(3) VARY X 1.8 (0.5) 3.8 SENTENCES 4 THRU 5.

(4) Y=X³ * (2=X)/(3*Cos A-p½)

(5) WRITE AND EDIT Y, X, A. P

(6) STOP

Written in this fashion, the problem is processed in the computer by the Math-Matic compiler using a library of relatively coded subroutines and generators to produce a problem written in machine code.

Since the pseudocode, in which the problem has been stated by the engineer, is completely independent of any specific computer or computer language, it represents an effective universal computer language, and problems written in the pseudocode could be run on any computer. The appropriate compiler and library of subroutines would bridge the gap, by translating the pseudocode into the desired computer code.

Data-processing code . . . Up to this point, we have been considering the subject of automatic programing techniques from the standpoint of the engineer and his use of the computer. But what of the many data-processing jobs which the computers are called upon to perform? Can they benefit from the use of compilers?

Initial attempts at developing a data-processing compiler revealed several serious problems.

1. It would be necessary to develop a language or symbology which would be acceptable to all installations and by means of which the operations could be stated.

2. A satisfactory method for describing the data must be developed, since the computer would be processing not only numeric information, but also alpha, and alpha-numeric, with and without decimal points.

To meet these and other problems, and to give the data-processing personnel a compiler which would be as effective and as powerful for them as the algebraic compilers were for the engineers, a coding system called Flow-Matic has been developed by the automatic program - development group of Remington Rand.

The pseudocode which this system uses consists of about 30 English-language verbs, such as: add, com-

pare, count, insert, jump, multiply, printout, etc. The nouns which are used with these verbs constitute the data description.

An example is a partial inventory updating program written in the pseudocode would be:

(0) INPUT INVENTORY FILE-A PRICE FILE-B; OUTPUT PRICED-INV FILE-C; UNPRICED-INV FILE-D; HSP-D.

(1) COMPARE PRODUCT-NO (A) WITH PRODUCT-NO (B); IF GREATER GO TO OPERATION 10; IF EQUAL GO TO OPERATION 5; OTHERWISE GO TO OPERATION 2.

(2) TRANSFER A TO D.

(3) WRITE-ITEM D.

(4) JUMP TO OPERATION 8.

(5) TRANSFER A TO C.

(6) MOVE UNIT-PRICE (B) TO UNIT-PRICE (C).

(7) WRITE-ITEM C.

(8) READ-ITEM A; IF END OF DATA GO TO OPERATION 14.

(9) JUMP TO OPERATION 1.

(10) READ-ITEM B; IF END OF DATA GO TO OPERATION 12.

(11) JUMP TO OPERATION 1.

(12) SET OPERATION 9 TO GO TO OPERATION 2.

(13) JUMP TO OPERATION 2.

(14) TEST PRODUCT-NO (B) AGAINST ZZZZZZZZZZZZ; IF EQUAL GO TO OPERATION 16; OTHERWISE GO TO OPERATION 15.

(15) REWIND B.

(16) CLOSE-OUT FILES C, D.

(17) STOP. (END)

A problem written in the English sentences which comprise the new pseudocode is processed on the computer by the compiler program to produce a running computer-coded program. The compiler has then made it possible to replace with a computer most of the manual effort previously required to translate a given problem from a written description into a detailed computer program.

To demonstrate the universal nature of compilers, the U. S. Air Force together with Sperry Rand Corp. has developed a compiler called AIMACO. This English language compiler is for the use of the Air Material Command on all of their computers. Using a UNIVAC I computer for compiling or writing in machine code, programs written in AIMACO pseudocode have already been run on the UNIVAC I and UNIVAC 1105 computers, and on the IBM 705.

Cost reduction . . . Compilers have been used on a variety of problems over a number of years. To the refiner who is effectively using a computer now to improve his profit, compiles present the opportunity for further cost reduction. Accurate and documented tests by computer users indicate that the over-all savings in time including problem definition, analysis, coding, and debugging—which were realized through the use of a compiler represented at least a four-to-one improvement over manual techniques.

The cost and length of time required to learn the pseudocode language of a compiler represents only a portion of that required for the machine code itself. This means that more people can be equipped to write programs for the computer.

Automatic programing, in its present state, not only reduces the cost of writing programs by letting the computer perform jobs previously done manually, but it also permits those persons who originate the problems—the engineers, accountants, and operating managers—to write their own programs in many instances. The ease of learning a pseudocode has been successfully demonstrated in various ways.

More than one engineer, unfamiliar with computer language, has mastered compiler language in a do-it-yourself course by studying the manuals. While at one Air Force location, a data-processing training course included as students three systems analysts, four programers, two career sergeants and the major's secretary. All completed the course successfully.

Of even greater importance, perhaps, than the cost-saving benefits to be derived through reduced training and programing expenditures, is that fact that programs written in a compiler pseudocode need not become obsolete with the development of improved computer systems by any manufacturer. By its very nature, the compiler pseudocode is independent of any given computer system.

BOOKS

OUR MINERAL RESOURCES. By Charles M. Riley. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16. 338 pp. $6.95.

This book offers an elementary approach to a subject most often taught at a college senior or graduate level. With a minimum of scientific terminology, it presents a great amount of scientific theory and useful fact.

The book summarizes the most modern knowledge about where and how our valuable mineral resources are formed by nature, and discusses some new deposits described only in the most recent literature.

It also offers some nongeological background material which provides the beginner with an appreciation of minerals and their importance to mankind.

One chapter deals exclusively with petroleum.

PROCESS EQUIPMENT DESIGN: VESSEL DESIGN. By Lloyd E. Brownell and Edwin H. Young. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16. 408 pp.

The design of process equipment requires a thorough knowledge of the functional process, the materials involved, and the methods of fabrication. One purpose for this book, listed by the authors, is to consolidate the basic concepts, industrial practices, and theoretical relationships useful in the design of processing equipment.

The design factors to be considered are many and varied, and often so interwoven that exact methods of attack are often impossible to formulate. Compromises are necessary and the design engineer often has only experience in similar or related fields to guide him in his choice. Thus, the book explains, the engineer must realize that considerable engineering judgment is required in applying all recommended specific methods of design.

The book was prepared primarily for senior and graduate students in engineering, and the needs of design engineers and consultants as well as those of students were considered in selecting the topics and methods of presentation.

EPOXY RESINS—MARKET SURVEY AND USERS' REFERENCE. By graduate students of Harvard Business School. Published by Materials Research, Box 363, Cambridge 39, Mass. 175 p. plus indexes. Soft cover, typewriter type. $18.50.

This report points out ways in which epoxies can be used as maintenance coatings. Eighteen chapters, each devoted to use and cost experience in a particular industry, will bring a company up-to-date on what others are doing in the field.

Also included in the report is a users reference. Here the reader can obtain a working knowledge of epoxy and related terms, find an exhaustive list of periodicals, and the author's selective listing of recommended readings by use area. The formulator directory lists use areas and locations.

A thorough market analysis is presented, including sales figures by manufacturer. Consumption is expected to reach 90 million pounds annually by 1963.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

Low filtrate loss and good rheology retention at high temperatures are practical features of this new drilling mud

BY JACK C. COWAN

CONVENTIONAL drilling fluids operate best at temperatures below 400° F. However, a newly proposed lignite-sodium-surfactant mud has low filtrate loss and retains good rheology at 450° F.

It is not a highly complex fluid and it is no more difficult to maintain and control than are conventional muds.

The lignite-sodium-surfactant mud is primarily designed for ultrahigh temperatures. It is not intended to replace conventional drilling fluids nor does it solve all high-temperature problems. However, this relatively simple and inexpensive mud is important because it further extends the temperature limitations of drilling fluids.

The study from which this new mud evolved was unique because filtration data were taken while the mud samples were at temperatures as high as 450° F. As a result, the data should be a better indication of actual conditions at the high temperatures than relative data taken in the conventional manner of heating samples and then cooling back to room temperature before testing.

Author is with Baroid Division of National Lead Co., Houston. Paper presented at 1959 Petroleum Mechanical Conference, of ASME, Houston.

What the problems are . . . The temperature limitation on conventional drilling fluids is usually the result of one or more of these factors:

- Some drilling-fluid components suffer thermal or biological breakdown.
- Viscosity of the liquid phase goes down as temperature goes up.
- Some combinations of materials solidify (i.e., lose fluidity) at high temperatures.
- Solubility of certain electrolytes decreases; this increases hydration of shale solids.

Hence, much of this study concerns techniques and equipment.

Low filtration important . . . Filtration of drilling fluids must be controlled at high temperatures. The most important single property of a drilling fluid is its ability to form a thin and impervious cake on the wall of the bore hole.[1] This property becomes even more significant when weighted muds are above 300° F.

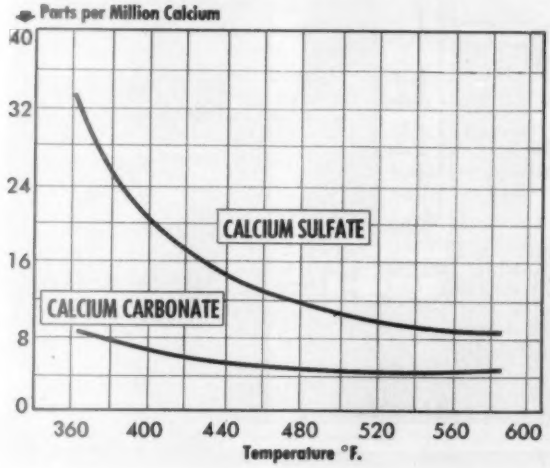
At high temperature conventional muds increase in filter loss. This high loss is generally caused by changes in the organic colloid being used for filter-loss control. Changes in these materials are due in part to oxidation,[2] polymerization or depolymerization, hydration, and other reactions. Because these changes are all associated with high temperature they are, for convenience, grouped under the title of "thermal degradation."

Gray, et al.,[3] found that starch used for filter loss control in lime muds breaks down when these muds are aged at 300° F. Dextrins and other products are formed; these are less effective than starch. When certain surfactant muds were investigated, it was observed that synthetic colloids such as carboxymethyl cellulose and acrylic polymers lose effectiveness above temperatures of 400° F.

These organics are known to be affected by the presence of polyvalent ions. Viscosity changes indicate that long-chain polymers can coil if the linkages joining the atoms in the molecules are free to rotate. It is assumed, therefore, that a polymer having several reactive points can, under the influence of various ions, coil enough to approach a spherical configuration. It is reasonable to assume that a coiled polymer is less effective for filter-loss control than a long, expanded polymer.

Results of our investigation indicate that high temperatures could be a factor in causing a similar coiling of synthetic polymers. In the case of acrylic polymers this phenomenon appears to be reversible. There are discrepancies in high-temperature filtration data of muds containing acrylic polymers. When a mud containing a polyacrylate is filtered at 400° F. its filter loss is high. Yet, an identical sample when cooled to room temperature and filtered has a relatively low filter loss.

Observations in both the laboratory and field indicate that there can be another type of breakdown in organic filter-loss additives such as starch and cellulose derivatives. These changes usually occur at moderate temperatures and are generally attributed to the action of microorganisms and enzymes. Some problems of extreme filter losses at elevated temperatures

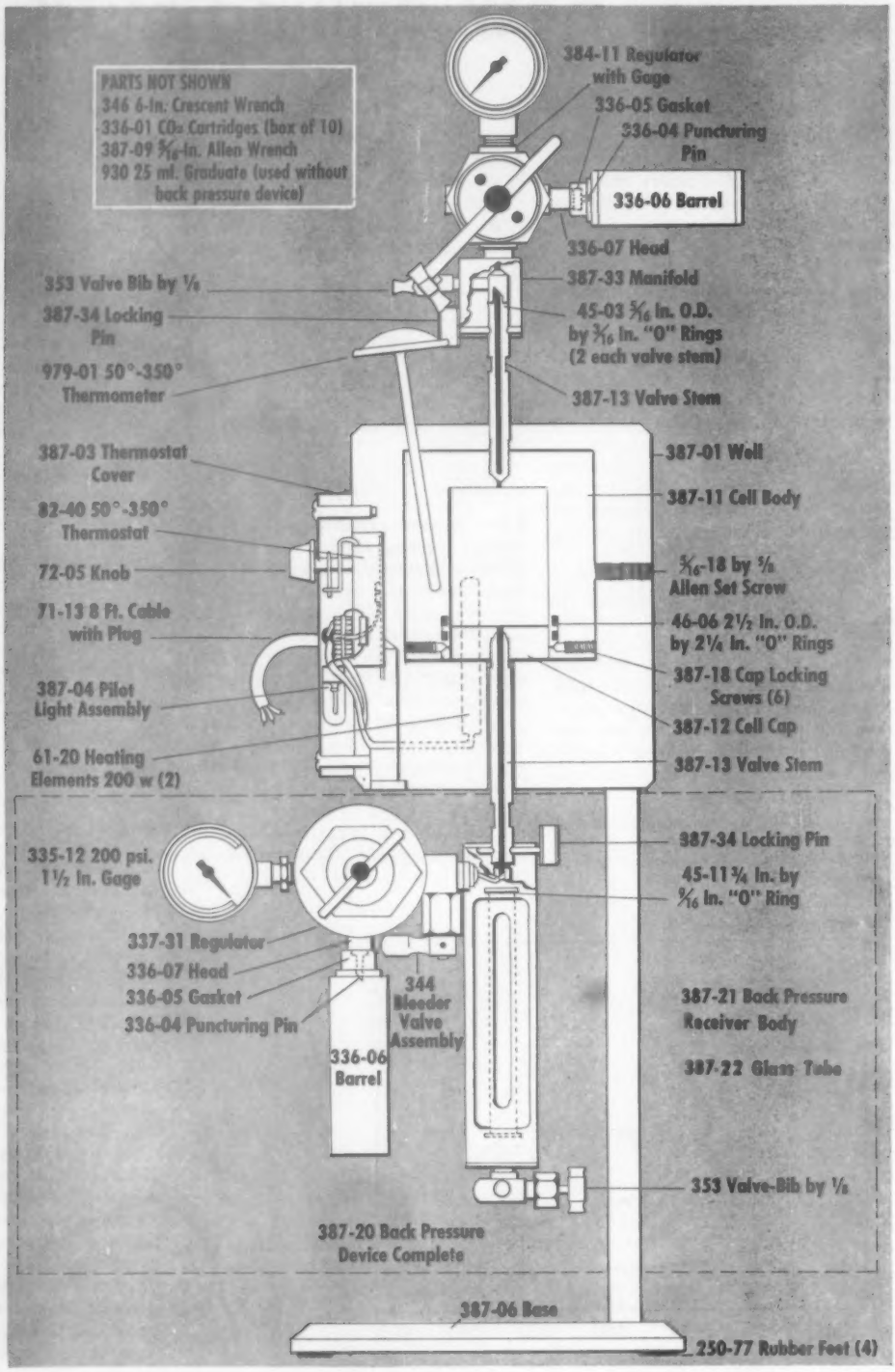


HYDRATION of clay solids may be caused by decrease in solubility of electrolytes with increasing temperature. Fig. 1.

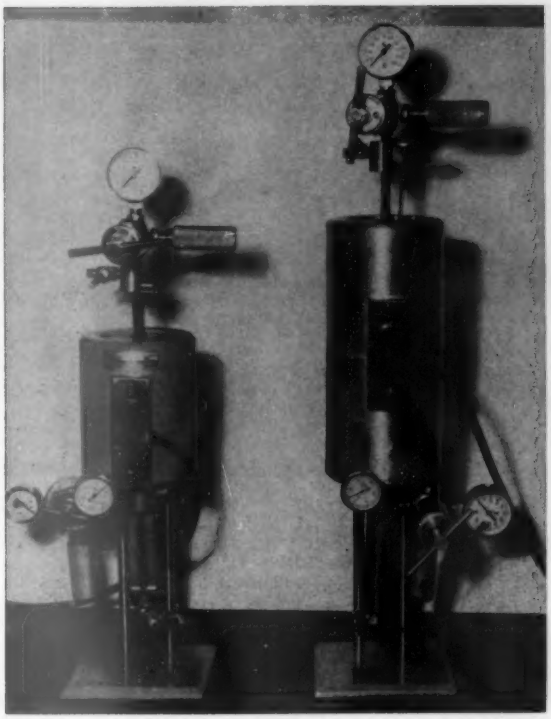
may also be related to bacterial or enzymatic effects. However, high temperature prevents the growth of most bacteria and probably is helpful in combating the problem.

Vis. falls as temp. rises . . . Another filtration problem at high temperatures is the decrease in the viscosity of water with increasing temperature. Filter loss is inversely proportional to the one-half power of the filtrate viscosity and may be calculated from the temperature if other conditions remain unaltered.

Temperature flocculation of solids is also important to increasing filtration with increasing temperature. Byck[6] found that the average permeability of filter cakes increased with increasing temperature. He deduced that the increase in permeability was similar to that expected under flocculating conditions, and therefore assumed temperature flocculating was responsible. There is also reason to believe that, in mud, temperature


PARTS NOT SHOWN
346 6-In. Crescent Wrench
336-01 CO₂ Cartridges (box of 10)
387-09 5/16-In. Allen Wrench
930 25 ml. Graduate (used without back pressure device)
384-11 Regulator with Gage
336-05 Gasket
336-04 Puncturing Pin
336-06 Barrel
336-07 Head
387-33 Manifold
353 Valve Bib by 1/8
387-34 Locking Pin
45-03 3/16 In. O.D. by 3/16 In. "O" Rings (2 each valve stem)
979-01 50°-350° Thermometer
387-13 Valve Stem
387-03 Thermostat Cover
387-01 Well
387-11 Cell Body
82-40 50°-350° Thermostat
72-05 Knob
5/16-18 by 5/8 Allen Set Screw
71-13 8 Ft. Cable with Plug
46-06 2 1/2 In. O.D. by 2 1/4 In. "O" Rings
387-18 Cap Locking Screws (6)
387-04 Pilot Light Assembly
387-12 Cell Cap
61-20 Heating Elements 200 w (2)
387-13 Valve Stem
335-12 200 psi. 1 1/2 In. Gage
387-34 Locking Pin
45-11 3/4 In. by 5/16 In. "O" Ring
337-31 Regulator
336-07 Head
336-05 Gasket
336-04 Puncturing Pin
344 Bleeder Valve Assembly
336-06 Barrel
387-21 Back Pressure Receiver Body
387-22 Glass Tube
353 Valve-Bib by 1/8
387-20 Back Pressure Device Complete
387-06 Base
250-77 Rubber Foot (4)

BAROID high-pressure, high-temperature filter press. This press was modified and increased as shown in Fig. 3. Fig. 2.



CONVENTIONAL and modified high-pressure, high-temperature filter press. Fig. 3.

MODIFIED filter-cell body and conventional filter-cell body. Fig. 4.

might cause hydrating of drilled solids where there is not sufficient electrolyte to maintain aggregation. Such high-temperature hydration might result in lower filtration rates if high-temperature flocculation could be avoided.

Aside from the things mentioned above, some muds have low filtration rates at high temperature but become solid or semisolid when heated to elevated temperature without agitation for a time. A lime mud is a typical example of this. Lime and caustic soda react with the silica and clay components in a drilling fluid to form poorly crystalline silicates. These act as cementing agents at temperatures near 300° F.

Low-alkalinity lime-treated muds are less susceptible to gelation at high temperatures. Most believe, therefore, that the more nearly neutral in pH a mud becomes, the less likely are the chances of forming cementation products. This is substantiated by the fact that cementation reactions can be avoided by allowing a mud system to stabilize at the natural pH range for montmorillonite of 7.0 to 9.0.

High-temperature hydration . . . Another cause of high-temperature gelation may be hydration of clay solids caused by the decrease in solubility of certain electrolytes with increasing temperature. Fig. 1 shows this for ions of calcium sulfate or calcium carbonate. There is a similar decrease in solubility for the calcium ion from calcium hydroxide. In a high-temperature system which depends on electrolyte concentration to prevent hydration and dispersion of solids, ions should be selected that either maintain or increase their solubility with increasing temperature and that are compatible with other ions necessary to the system.

Surfactant muds were designed primarily to cope with the problems of high temperature. These muds are limited by the temperature tolerance of the filter-loss additives and for the most part, have used cellulose and polyacrylate derivatives for filtration control.

Certain mined lignites, when reacted with sodium alkalies, have proved effective as filtration control agents in surfactant muds.

Water-loss control . . . Surfactant systems generally use nonionic surfactants such as the oxyethylated phenols and the oxyethylated nonyl phenols. Used with soluble salts, these products are effective in keeping drilled shale solids in an aggregated state.

From the first, it has been clear that the usual thinners or dispersants for control of flow properties should not be used in surfactant muds. This is because such treatment would cause shale particles to disperse and hydrate rather than remain as less-hydrated aggregates that could be maintained if only soluble inorganic salts were present. As a result of this treating limitation, high viscosities, gel strengths, and yield points have been characteristic of high-density surfactant muds.

The usual sodium carboxymethyl cellulose or polyacrylate derivatives only make flow and gel characteristics worse. With these muds, it has been necessary to resort to the centrifuge and water dilution to control flow and gel properties.

Currently in the field, it is the practice to use flow chemical agents in surfactant muds. Calcium surfactant or a gypsum mud employ CMC or a ferrochrome lignosulfonate for filter-loss control up to temperatures of 325° F. to 375° F. At higher temperatures, some muds have been converted to sodium surfactants to enable use of the more thermally stable polyacrylate derivatives. Conversion to sodium is necessary because acrylic polymers are sensitive to calcium ion concentrations above 100 p.p.m.

A field case . . . Table I shows the value of alkali-lignite in a high-density surfactant mud. This sodium surfactant mud sample used sodium carboxymethyl cellulose and a polyacrylate derivative. It came from a 17,000-

TABLE 1—USE OF MINED LIGNITE, CAUSTIC SODA, AND SODA ASH FOR FILTRATION CONTROL IN A LOW-SODIUM SURFACTANT FIELD MUD*

Properties—	Before treatment	After lignite-alkali treatment
Weight, parts per gal.	17.5	17.5
Viscosity, cp.	86	82
Initial gel, g.	20	0
10-min. gel, g.	50	27
pH	8.0	7.3
Filtrate, API, ml.	12.5	1.4
Plastic viscosity, cp.	31	49
Yield point, lb. per 100 sq. ft.	43	19
Filtrate, 400° F., 500 psi., ml. per 30 minutes	140	19
Oil, % by volume	6	
Solids, % by volume	34	
Water, % by volume	60	

*Sample of low-sodium surfactant field mud obtained from well in Plaquemines Parish, Louisiana, while drilling at 17,000 ft.

ft. well in Plaquemines Parish, Louisiana.

Sample treatment was: 15 lb. mined lignite, 1.3 lb. caustic soda, and 1 lb. soda ash per barrel of mud. The viscosities, gel strengths, and yield point were reduced. At the same time a low pH of 7.3 (80° F.) was maintained while reducing filtrate at 400° F. from 140-ml. per 30 minutes to 19-ml. per 30 minutes.

An unusual feature of this mud is the concentration of lignite used to obtain the low filter loss at high temperature. Costwise, the amount involved, including accessory chemicals, is less than when conventional synthetic polymers are used. (Tables 2 and 3). Another unique property of this alkaline-lignite material is its ability to function as a filter-loss reducer independent of added or drilled solids. Table 4 shows how various organic filter-loss additives compare in water solutions. Even though CMC gave a low filter loss, the viscosity at the concentration necessary would be impractical for field usage.

Converting to new mud . . . Currently there is wide use of various gypsum muds using ferrochrome lignosulfonates and perhaps CMC at temperatures up to 375° F. Table 5 shows the high-temperature properties of a gypsum mud before and after conversion to a lignite-sodium surfactant. The recommended steps for such a conversion are:

1. Eliminate alkali additions being used to control pH in the gypsum mud and continue additions of ferrochrome lignosulfonate to reduce pH to 7-8.
2. Add water-soluble oxyethylated phenol surfactant to obtain a slight excess (usually 2 to 6 lb. per bbl., depending upon solids present).
3. Add sodium chloride to raise the salt concentration to 15,000 to 20,000 p.p.m.
4. Add soda ash to reduce total hardness.
5. Add 5 to 15 lb. per bbl. lignite, 0.25 to 1.0 lb. per bbl. caustic soda, and soda ash to raise pH to 8.5 to 9.5.

If drilled solids have accumulated in the mud, it may be desirable to reduce solids content with a centrifuge or by water dilution. It is also desirable that the mud contain 8 to 10% oil before adding surfactant.

Laboratory data indicate that gypsum muds converted to a lignite-sodium-surfactant mud by the above steps do not go through transition "breakovers." The mud properties generally remain the same throughout conversion. Other muds could be converted similarly. However, the medium pH and the ferrochrome-lignosulfonate-treated gypsum mud make it a particularly convenient system for this type conversion.

TABLE 2—COST AND EFFICIENCY OF MINED LIGNITE-SODIUM ALKALI AND SODIUM CARBOXYMETHYL CELLULOSE FOR FILTRATION CONTROL IN A SODIUM SURFACTANT MUD

Material	Concentration (lb./bbl.)	Cost ($/bbl.)	API filtrate (ml.)	Aged 16 hours at 450° F. API filtrate (ml.)	Filtrate 350° F., 500 psi. (ml.)	Filtrate 450° F., 500 psi. (ml.)
Mined lignite-sodium alkali	15	1.50	1.8	12.0	24	85
Sodium carboxymethyl cellulose	3	2.70	4.6	37	No shutoff	No shutoff

TABLE 3—COST AND EFFICIENCY OF MINED LIGNITE-SODIUM ALKALI AND A POLYACRYLATE DERIVATIVE FOR FILTRATION CONTROL IN A SODIUM SURFACTANT MUD

Material	Concentration (lb./bbl.	Cost ($/bbl.	API filtrate (ml.)	Rolled 16 hours at 150° F. API filtrate (ml.)	Aged 16 hours at 400° F. API filtrate (ml.)	Filtrate, 400° F., 500 psi. (ml.)
Polyacrylate derivative	1.5	1.05	6.8	4.0	5.9	80
Mined lignite sodium alkali	10	1.05	1.2	0.8	2.2	24

TABLE 4—RELATIVE EFFECTIVENESS OF ORGANIC FILTER LOSS ADDITIVES IN WATER SOLUTIONS*

Materials	Concentration (lb./bbl.)	API filtrate (ml.)	pH	Viscosity (cp.)
Starch	15	No shutoff	7.2	9
Sodium carboxymethyl cellulose	15	16	8.7	541
Polyacrylate	15	No shutoff	9.1	64
Lignosulfonate	15	No shutoff	9.2	4
Mined lignite-sodium alkali	15	7.0	9.0	4

*All samples stirred a total of 20 minutes on a Hamilton Beach mixer and rolled for 16 hours at 150° F. before testing.

TABLE 5—HIGH TEMPERATURE PROPERTIES OF A GYPSUM FERROCHROME LIGNOSULFONATE MUD* BEFORE AND AFTER CONVERSION TO A LIGNITE SODIUM SURFACTANT MUD

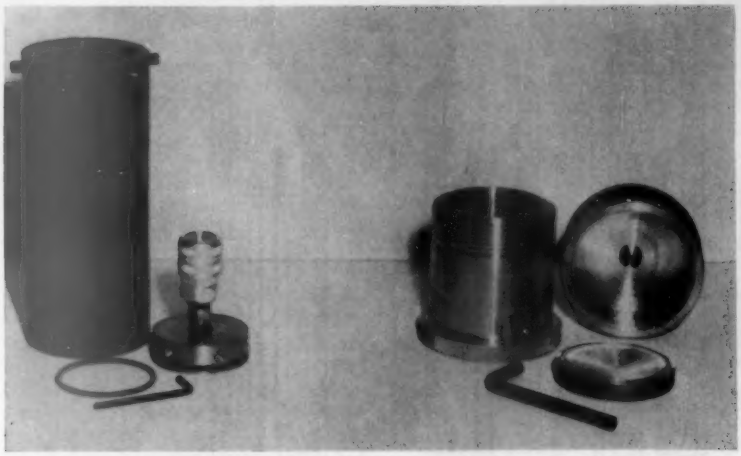
	Gypsum ferrochrome lignosulfonate mud before conversion	Lignite sodium surfactant mud after conversion
Weight, parts per gal.	16.0	16.0
Viscosity, cp.	42	54
Initial gel, g.	0	0
10-min. gel, g.	0	0
pH	9.1	9.5
Filtrate, API, ml.	5.2	0.0
Filtrate, 350° F., ml./30 minutes	35	6.5
Filtrate, 400° F., ml./30 minutes	46	8.0
Filtrate, 450° F., ml./30 minutes	78	10.0

Materials added for conversion: 8 lb. per bbl. water-soluble oxyethylated phenol, 2.4 lb. per bbl. sodium chloride, 3 lb. per bbl. sodium carbonate, 10 lb. per bbl. lignite, and 0.5 lb. per bbl. sodium hydroxide.

Aging tests of 16, 64, and 352 hours indicate that lignite-sodium-surfactant muds are quite stable over long periods. Table 6 shows the static aging properties of a lignite-sodium-surfactant mud prepared with 0.56 bbl. water, 10 lb. lignite, 1.2 lb. caustic soda, 13 lb. bentonite, 3 lb. salt, 6 lb. oxyethylated phenol surfactant, 0.06 bbl. diesel fuel, 473 lb. weight material, and 1.5 lb. of soda ash.

Test equipment, procedure . . . To get reliable data at 350° to 450° F. the conventional testing equipment had to be modified. The Baroid high-pressure, high-temperature filter press (see Fig. 2) was modified and cell-body volume increased from 140 ml. to 490 ml. as Fig. 3 shows. More working volume was necessary to hold sufficient mud sample and to accommodate expansion of the fluid phase with temperature. The 200-psi. gage on the back pressure device was replaced with a 1500-psi. gage to make higher back pressures possible. Fig. 4 shows the fully rigged filter press before and after modification.

Unpressurized high-temperature storage cells gave questionable and anomalous data, particularly above 350° F. Mud samples aged in this type of cell generally had higher vis-



MODIFIED and conventional high-temperature static aging cells. Fig. 5.

TABLE 6—STATIC AGING PROPERTIES OF A LIGNITE SODIUM SURFACTANT MUD

Properties	Initial	Rolled 16 hours at 150° F.	Aged 16 hours at 400° F.	Aged 64 hours at 400° F.	Aged 352 hours at 400° F.
Weight, parts per gal.	16.5	16.5	16.5	16.5	16.5
Viscosity, cp.	64	51	104	86	82
Initial gel, g.	0	0	0	0	0
10-min. gel, g.	10	0	50	100	70
pH	9.4	8.9	8.1	8.0	8.0
Filtrate, API, ml.	1.6	1.7	2.6	3.3	8.4
Plastic viscosity, cp.	43	36			
Yield point, lb./100 sq. ft.	7	1			
Condition of mud			Gel	Gel	Gel
Shear strength, lb./100 sq. ft.			125	200	320

TABLE 7—EFFECT OF PRESSURIZED AND UNPRESSURIZED STATIC AGING CELLS ON MUD PROPERTIES

Properties	Gypsum ferrochrome lignosulfonate mud aged 16 hours at 350° F. (Unpressurized)	Gypsum ferrochrome lignosulfonate mud aged 16 hours at 350° F. (Pressurized)	Lignite-sodium-surfactant mud aged 16 hours at 350° F. (Unpressurized)	Lignite-sodium-surfactant mud aged 16 hours at 350° F. (Pressurized)
Weight, lb./gal.	16.0	16.0	16.0	16.0
Viscosity, cp.	51	46	82	60
Initial gel, g.	0	0	0	0
10-min. gel, g.	20	20	40	40
pH	7.8	8.6	8.3	8.9
Filtrate, API, ml.	13	14	1.2	0.1
Plastic viscosity, cp.	23	25	44	37
Yield point, lb./100 sq. ft.	15	4	27	20
Condition of mud	Gel	Gel	Gel	Gel
Shear strength, lb./100 sq. ft.	250	200	200	100

cosities, gel strengths, and yield points, and lower pH values than identical samples aged under a pressure equal to the vapor pressure of water at the storage temperature. Table 7 shows these differences both in a gypsum-ferrochrome lignosulfonate mud and a lignite-sodium-surfactant mud. Fig. 5 pictures the conventional unpressurized storage cell and the pressurized storage cell used.

It must be emphasized that these static aging tests, whether pressured or unpressured, give only relative data. They are not considered a true representation of actual flow properties at high temperatures. This is because present procedures require cooling samples below 212° F. before determining shear strength or rheological properties. The static storage at high temperature is reasonable in that the drilling mud approaches bottomhole temperature only when left in the well for a time.

Cooling the mud before measuring shear strength is not reasonable because mud in the well must move up the hole before it can cool. Thus any gel strength is broken while the mud is at maximum temperature. Byck[6] pointed out that different muds have minimum viscosities at different temperatures. Furthermore, chemically treated muds have minimum viscosities at higher temperatures than untreated muds.

As interest grows in high-temperature mud, there will be greater need for testing equipment that can determine rheological properties while fluids are at extreme temperatures.

To get more accurate data at the high temperature, special test procedures were followed. For instance, there was distillation across the filter cake in muds filtered above 350° F. when back pressure was only 100 psi. This was corrected by applying 425 psi. (the vapor pressure of water at 450° F.) to all samples filtered between 350° and 450° F. Various initial pressures, depending upon test temperatures, were applied before heating the samples in order to prevent boiling of the mud and to maintain a final differential pressure of 500 psi.

To get storage data at extreme temperatures, the aging cells were pressured initially to the vapor pressure of water at test temperature. Nitrogen was used to pressurize both filter cells and static aging cells. It is assumed from this investigation that rheological data obtained at room temperature and extrapolated is only relative.

Acknowledgements

The author wishes to thank D. J. Weintritt, Jay P. Simpson, and E. W. Louden of Baroid Div. for their helpful suggestions and criticisms.

References

1. Drilling Mud: "Methods of Determining the Filtration Characteristics of Drilling Muds," Vol. 6, No. 1 May 1938.

2. Whetham, P. E.: "The High Temperature Stability of Sodium Carboxymethyl Cellulose in Drilling Fluids," paper presented before Drilling Fluids Study Committee of the API in Houston, on May 23, 1958.

3. Gray, G. R., Neznayko, M., and Gilkeson, P. W.: "Some Factors Affecting the Solidification of Lime-Treated Muds at High Temperatures," The Oil and Gas Journal, July 28, 1952.

4. Beerstecher, E., Jr.: Pet. Microbiology, Elsevier Press, Inc. 1954.

5. Reese, E. T.: "Biological Degredation of Cellulose Derivatives," Ind. Eng. Chem., Vol. 49, No. 1, January 1957.

6. Byck, H. T.: "Effect of Temperature on Plastering Properties and Viscosity of Rotary Drilling Muds," Pet. Tech. of AIME, November 1939.

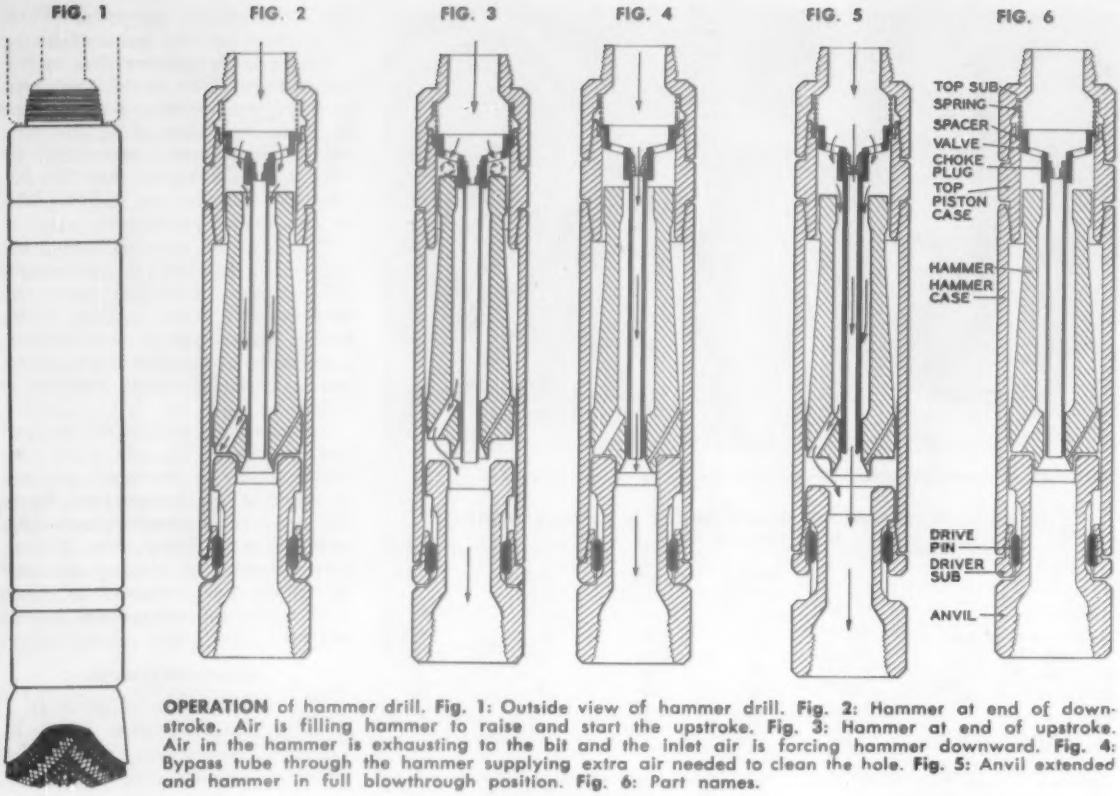
7. Watkins, T. E.: "A Drilling Fluid for Use in Drilling High Temperature Formations," paper presented at spring meeting, API Southwestern District, March 4, 5, and 6, 1953, Fort Worth.

8. Coffer, H. J. and Clark, R. C., Jr.: "An Inexpensive Mud for Deep Wells," paper No. 288-G, presented at fall meeting of the Petroleum Branch, Amer. Inst. of Min. and Metl. Engrs., Dallas., October 19-21, 1953.

9. Burdyn, R. F., and Wiener, L. D.: "That New Drilling Fluid for Hot Holes," The Oil and Gas Journal, September 10, 1956.

10. Betz, W. H., and L. D.: "Handbook of Industrial Water," p. 74.

11. Hodgman, C. D.: Handbook of Chemistry and Physics, 31st. Ed. Chemical Rubber Publishing Co., Cleveland, 1949.



OPERATION of hammer drill. **Fig. 1:** Outside view of hammer drill. **Fig. 2:** Hammer at end of downstroke. Air is filling hammer to raise and start the upstroke. **Fig. 3:** Hammer at end of upstroke. Air in the hammer is exhausting to the bit and the inlet air is forcing hammer downward. **Fig. 4:** Bypass tube through the hammer supplying extra air needed to clean the hole. **Fig. 5:** Anvil extended and hammer in full blowthrough position. **Fig. 6:** Part names.

A long program of laboratory and field testing has resulted in the production of a new hammer drill operated by air or gas. Where air drilling is now economical, this hammer drill will cut well costs even further, since this new . . .

Hammer drill speeds air drilling

BY WALTER E. LILJESTRAND
Mission Manufacturing Co.,
Houston

RESULTS of drilling in 12 field wells and of laboratory testing shows that the newly developed air hammer can:

1. Increase drilling rate two or three times over straight air drilling.
2. Prolong bit footage as much as 4 times straight air and 12 times mud drilling.

Moreover, this hammer drill is simple in construction and operation. It is also rugged and reliable. It can be added to air rotary drilling with no major changes in either equipment or operation. And, geologists like the increased size of rock cuttings that the hammer drill gives them.

Specially modified rock bits are already available for use with the air or gas-operated hammer.

Started with churn drill . . . There are several steps of progress in drilling methods. Cable tools were an early way of cutting the formation by impact. Impact is the most effective way to break rock; however, the cable-tool rig struck only a few blows a minute and time for bailing made drilling rate slow.

The development of mud rotary drilling gave, among other advantages, continuous hole cleaning and increased rate of contact with the hole bottom. Impact force in hard formations is brought about by use of heavy drill-collar strings. The impact force is reduced by use of a rolling bit which was necessary to increase bit life.

Air rotary drilling was developed to speed drilling in hard rock where pressure of mud made cutting difficult. The low air pressure does not interfere with flaking the cutting off the hole bottom. Savings from mud cost and increased drilling rate more than offset the extra cost of air or gas supply.

Quarry drillers took the cable-tool

This article is extracted from a paper titled, "Use of Percussion Tools With Air and Gas" presented at 1959 annual meeting of American Association of Oilwell Drilling Contractors, Oklahoma City.

impact idea and greatly increased the blows per minute by using an air-operated piston hammer on drill rod or bit instead of jars. They got very high drilling rates by using a heavy hammer blow and a solid-head "X" type bit with carbide inserts.

Latest development in oil-well drilling is the combination of the air rotary method with the hammer drill of the quarries. The combination of hammer blows with air and rotary bits gives the best feature of each method.

Cutting impact comes from a sharp hammer blow and not from heavy drill collars. Cuttings are removed readily in the low air pressure. Drilling is continuous and impacts come with a high frequency. Bit life is longer and drilling faster. Wherever air drilling can be used, percussion drilling can be added and the well will be less expensive.

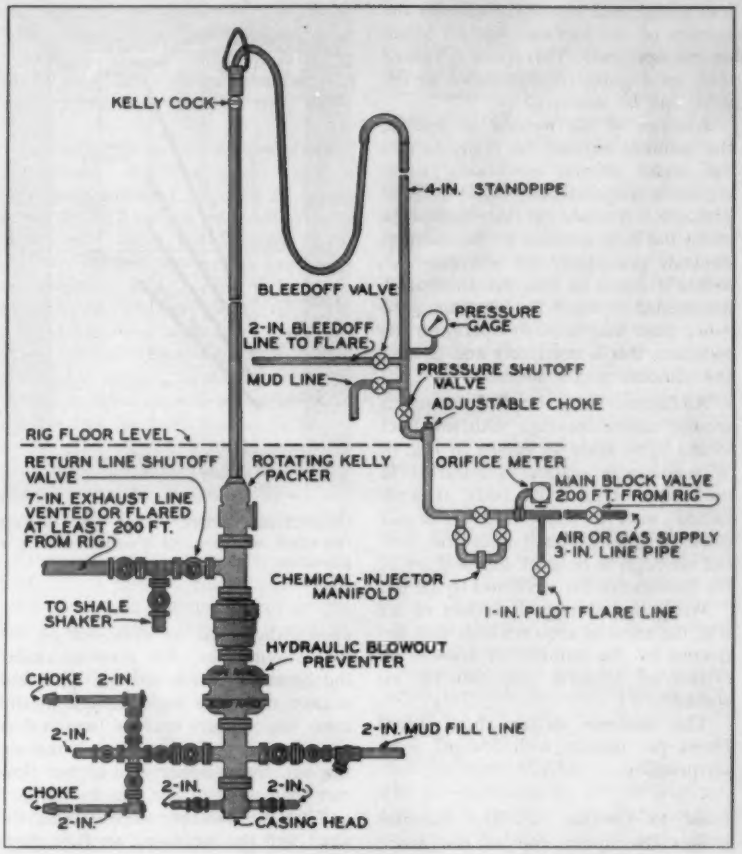
Where it came from . . . Development of a successful hammer drill is the fruit of years of design and field testing. Eight patents have been granted to the inventor, Ross Bassinger, as a result of his 10 years of design and field testing.

The hammer-drill version perfected for quarry use was modified for oilfield use by an oil-company research laboratory during 2 years of testing and development. Development and testing are continued by the licensed manufacturer of the tool.

Hammer drills in field tests have drilled a total footage of 13,924. The drilling was done in 12 wells in Oklahoma, New Mexico, Utah, Texas, Wyoming, Montana, and Alberta. Although there is seldom accurate data for comparing drilling rates of different methods, specific comparisons of hammer drilling to air rotary ranged from 1.5 to eight times as fast. Studies of all the tests indicate that increase of two to three times air rotary-drilling rates should be expected. Bit footages are the most difficult to compare, but studies show increases of 1.3 to four times air rotary can be expected.

How it is run . . . The hammer drill is installed between the bit and the drill collar. Compressed air or gas operates the hammer. Air equipment is the same as used for air rotary drilling. It should supply the extra air needed to handle the extra cuttings from the faster drilling rate.

Pressure drop across the tool should be from 250 to 350 psi. The bit is a roller rock bit with minor modifications. Normally less weight is carried on the bit. Rotating speed is in the range of 60 r.p.m.



SUGGESTED minimum piping and manifolds for high-pressure well. Fig. 7.

Inside the tool . . . As Fig. 1 shows, the hammer drill is 6¾ in. in diameter, and 61 in. long from shoulder to shoulder. The upper end connects to the drill collar with a 4½-in. API pin; the bottom end has a 4½-in. API box for the bit pin. It uses bits from 7⅝ to 9 in.

A smaller size is also available. It is 5¼ in. in diameter, 65 in. long from shoulder to shoulder and has 3½-in. API connections for bits ranging from 6 to 6¾ in.

Drill-collar loads and torque for rotation are transmitted to the bit through the heavy case. The hammer, which is the moving part, is completely protected by the case and its operation is unaffected by drilling loads and conditions.

The tool is ruggedly built so that it easily withstands the tightening force of tongs and other normal handling on the derrick floor.

How it operates . . . Compressed air enters the top of the tool; it is divided at the valve and used for two purposes. First purpose is to operate the hammer. The air passes through a ring of holes in the valve body shown in Fig. 2, to keep the space above the hammer under air pressure.

Fig. 2 shows the hammer down at the bottom of the stroke. Air flows below the finger of the valve into the hole in the top end of the hammer filling it. This air flow and pressure also fills the cavity around the bottom end of the hammer flowing through the angled ports in the bottom of the hammer. This air pressure exerts an upward force on the hammer which is greater than the downward force on the top of the hammer. This is because of the larger area of the bottom.

The hammer lifts and as it moves, the upper finger valve is covered, closing the inlet to the hammer body cavity. With further lifting, the lower finger valve opens the inlet port to the anvil exhausting the air in the cavity and under the hammer out through the anvil to the bit. This hammer position is seen in Fig. 3.

After the exhaust of the air under the hammer, the principal force on the hammer is the inlet air pressure on the top annular ring. This pressure forces the hammer back down against the anvil with a sharp blow. The hammer cavity refills as the hammer comes off of the top finger valve.

The annular area between the bot-

tom piston and the top piston on the outside of the hammer has no effect on the operation. This space is vented with an angular passage down to the anvil and bit discharge.

Amount of air needed to operate the hammer depends on many factors but under normal conditions, 1,400 c.f.m. is required for 350-psi. inlet pressure. Amount of air needed to clean the hole annulus of the cuttings depends principally on annulus size. While it could be that the amount of air needed to clean the annulus is no more than that used in operating the hammer, this is not likely and usually the annulus needs additional air.

Additional air is supplied through a second central passage with the inlet in the valve body as shown in Fig. 4. A replaceable orifice is installed in the center of the valve body. It is retained with a snap ring. The air under it goes through a central tube out through a hole in the bottom of the hammer to the anvil and to the bit.

When the additional amount of air that the annulus requires over that delivered by the hammer is known, an orifice of suitable size can be installed.

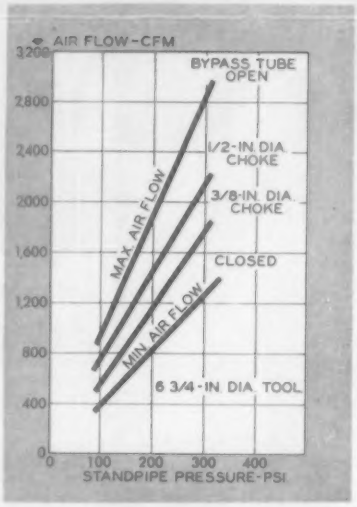
The hammer strikes about 1,800 blows per minute with 350-psi. inlet air pressure.

Load to the bit . . . The hammer strikes the upper end of the anvil. The blow of the hammer goes through the anvil and into the bit driving it into the formation to fracture the rock. The anvil moves down the amount the bit penetrates into the rock. For this reason, it has a sliding joint in the bottom of the tool using four drive pins in longitudinal slots in its outer diameter. These drive pins also transmit the torque from the hammer case to the anvil to turn the bit in the hole.

In addition to the impact force of the anvil on the bit, there is a steady force produced through the hammer case and driver sub which rests on a shoulder on the outside of the anvil. This force of 2,000 to 12,000 lb. comes from the drill-collar load and makes sure the bit is firmly in contact with the bottom of the hole and that the air pressure in the tool does not lift the hammer case away from the anvil and decrease the hammer blow.

High drill-collar loads speed penetration but the saving is almost entirely offset by shorter bit life. Future experience will show the best combinations for lowest cost and control of deviation.

Before the bit touches the bottom of the hole or after it comes off bottom, weight of the anvil and hammer



ORIFICE-SELECTION chart to project required air flow for available supply pressure. Fig. 8.

causes the anvil to slide out of the tool about 3 in. Air pressure under the hammer lifts it off the anvil but it does not raise high enough to slip over the finger on the top valve. As a result, air flows continuously through the hammer at a higher flow rate than normal. See Fig. 5.

Then the hammer stops striking the anvil and the increased air flow gives the best hole cleaning. The air should be turned on and allowed to flow through the hammer and bypass tube before the bit reaches the bottom of the hole.

It is much more important, however, always to start rotation before the bit is allowed to contact the bottom of the hole. Contact without rotation causes a drilling blow to develop. This drives the bit into the formation so that it is difficult to start rotation if it can be done at all. This is especially true in medium hard or soft formations.

Other parts of the hammer drill shown in Fig. 6, such as top sub, spring, spacer, and the top piston case are nonmoving parts with simple functions and need no description here. They are designed with threaded joints for access to the different parts for adjustment, service, or cleaning.

Piping for hammer drilling . . . So far in this paper, there has been no discrimination between gas and air as an operating medium. The tool usually operates just as well with either, and where the word air has been used, the word gas could have been used.

Fig. 7 shows the air or gas-drilling piping diagram. This might be considered as a standard piping setup suitable for either air or gas supply with provisions included to take care of the differences between the two supplies. Supply lines to the standpipe may be 2 in. in diameter for a high-pressure gas line but certainly should be 3 in. or larger for an air supply to reduce the pressure drop caused by friction. The main block valve 200 ft. from the rig is installed for emergency control.

A reasonably accurate orifice meter is a must when using gas because pressure alone does not indicate that anything is flowing through the tool or through the annulus. The meter is also desirable on air installations because it gives a quick check on compressor performance and response of the hole to the pressure delivered.

The chemical-injector manifold may be used either to introduce lubricating oil for the tool or corrosion inhibitor when limewater is required in the annulus.

The adjustable choke controls flow of gas as desired. It should be left open when air is used. The pressure shutoff valve on the air gas line and the valve on the mud line allow changeover to either kind of drilling. The pressure shutoff valve and the bleedoff line also allow shutting off the gas supply and venting the drill pipe before changing a joint.

The equipment shown below the derrick floor in Fig. 7 is suggested as minimum needed to properly handle a gas or air drilling job into unknown formations. A 7-in. minimum exhaust line is suggested. It should be adequately anchored because surging is to be expected in the return. It should be straight and have no sharp bends especially at the open end. It is anchored best by burying it in a trench.

It is important that all drilling instruments be working properly. Rate of penetration, rotating speed, drill collar load, air or gas pressure, and air or gas quantity are all needed to interpret conditions at the bottom of the hole where so many variable factors are located. This is especially true when there is some water flow into the annulus.

Surface indications . . . The tool is so easy to use that the driller does not need to know the tool is on except for touching the bottom of the hole. On the other hand, it may be desirable sometime to check the operation of the hammer on the derrick floor. Then, the tool should be installed on the kelly and raised above the rotary. A heavy plank should be placed across the rotary and the bit lowered and rested on it. In this position, with the weight of the kelly closing the tool, the air-supply valve should be

opened gradually and the tool will begin to hammer.

It will be noticed if the air pressure is high enough to raise the tool and the kelly off of the anvil, the rate of hammering will decrease and perhaps stop. This is a condition that occurs when one is blowing through and not drilling on the bottom.

If such a test is to be run with gas, the tool would have to be installed in the hole and the operation of the hammer would be reduced to the condition when blowing. By listening carefully to the kelly, one may detect pulsing sounds that tell if the hammer is moving freely.

Modified bits . . . Standard rock bits with minor modifications are used on the hammer drill. Type to select with respect to tooth pattern is the same as for air rotary drilling and the particular formation.

The modifications required are a reinforced weld between the legs to prevent cracking under the repeated impact and a press-fit ball retaining plug to prevent its coming out under the vibration. Bits with these changes can be obtained from several bit manufacturers and have been supplied at no increased price when specified for hammer drill use.

These bits must also have the nozzles or jets removed and a large center hole cut in the body to provide free flow of air from the tool to the annulus.

There is too little experience to give a clear-cut statement on bit action, but it is known that they do not wear as rapidly as in conventional drilling. On the average, the bits on the hammer drill should run 1.3 to 4 times longer than with conventional air rotary drilling and 8 to 12 times longer than mud rotary.

Float needed . . . A drill-pipe float valve should be installed in the drill collar directly above the tool to prevent back flow of cuttings or water into the tool while a connection is being made. Until now, all commercial float valves have caused trouble either due to vibration from drilling or because of hydraulic shock caused by injected water. A special float valve has been made and is available with the tool. It should be used until other commercial models are available.

A float valve should also be used in the top of the drill string to reduce the venting time while making a drill-pipe connection. It also would reduce the time needed to reestablish full circulation.

The hammer drill is ruggedly built and can withstand a great deal of abuse in normal service. However, it has moving parts built to precision tolerances and care must be taken to make sure that foreign material does not get into it to score or stick them.

Keep it clean . . . Foreign material can come from several common sources. Mud and rust will be found in all the drill strings where they have been used with conventional mud drilling. Before the pipe is used with the hammer drill, it should be wire-brushed and blown clean.

Rust may also come from a gas line and it should either be blown out or a suitable strainer installed to catch such particles. In winter, moisture in the gas line has been known to freeze in the tool with the expanding of the gas and has prevented it from operating.

When the hammer drill is installed, it should be cleaned inside and well lubricated with a light oil such as SAE 10. A positive-displacement-type oiler should be put on the air or gas line at the chemical-injector manifold.

Handling hammer in the string . . . When pipe tongs are used on the tool, they should be kept close to the joint so that the tong load will not come onto the hammer case outside of the hammer piston.

If it is necessary to disassemble the tool for service or cleaning, the joints should be broken while the tool is still hanging in the derrick. It should be noted first, however, that three of these joints are carefully locked with soft-iron locking rings and these can be unlocked by straightening them with a thin-bladed chisel. These locking rings are a safety precaution to insure that the tool never unscrews in the hole.

Samples are good . . . Many samples or actual cuttings from air rotary drilling and hammer drilling have been collected. The largest cuttings with the hammer are more than 10 to 1 larger by weight. All of the cuttings from the air rotary drilling are fine. Cuttings from the hammer drill are various sizes with the average much larger than air rotary. The largest cuttings obtained are large enough to give the geologist a clear picture of the type of material being drilled through and may be large enough for some core analysis tests.

Fig. 8 shows the volume of air passing through the hammer drill with different orifices and inlet pressures. When inlet pressure is known, the orifice should be selected to pass sufficient air to insure good hole cleaning of the extra-large load of cuttings in the largest annulus.

Recent Drilling Performance

Nine drilling tests were reported in the AIME paper of October 6, 1959, by Howard, Vincent, and Wilder. Since that report the hammer drill has been used in three more wells.

Well J, Oklahoma . . . The hammer drill was used in this well to drill three intervals totaling 303 ft. of 8⅜-in. hole. The first began at 11,037 ft. and the last ended at 11,617 ft. Gas was used with the pressure ranging normally from 250 to 300 psi.

Light weights from 2,000 to 5,000 lb. were used in an attempt to control deviation. The formations were very hard and drilling rate with air rotary was only 4 ft. per hour. With the hammer drill, it was 15 ft. per hour.

The bits used both on air rotary and hammer drilling showed little wear as they were the carbide-insert type. Each time the tool had to be pulled, it was because the rotary hose line had clogged the tool or the float valves had broken.

Foaming agents with water were injected through the tool with no difficulty.

Well K, New Mexico . . . This well was gas-drilled using 250 to 310 psi. The 6¾-in. hammer was used to drill 8¾-in. hole in soft sand and shale from 5,176 to 5,350 ft. and from 6,066 to 6,454 ft. Penetration rates were the same as air rotary. Bit wear was also comparable.

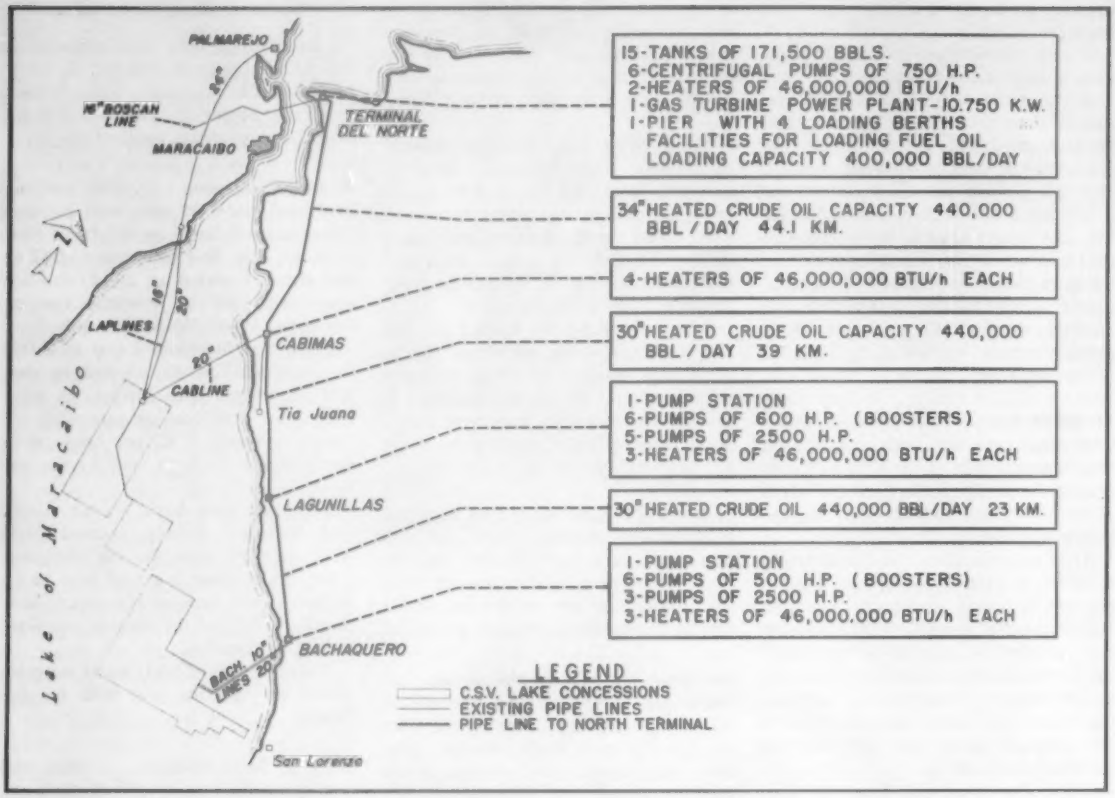
The 5¼-in. hammer was used to drill 6⅛-in. hole from 7,658 to 7,925 ft. in a much harder limestone. Three carbide-insert bits were used, breaking some carbides and showing some bearing wear.

Penetration was 35 ft. per hour compared to 20 ft. per hour in an offset well drilled with mud. Three bits were used to drill the same footage as four in the mud. The test was terminated when the well was completed.

Well L, Texas . . . This well was drilled with gas with pressures from 150 to 350 psi. An 8¾-in. carbide-insert bit was used with gas rotary at 7,500 ft. and was making 47 ft. per hour.

The hammer drill was started at 7,672 ft. using a conventional rock bit and made 60 ft. per hour. It was found that the automatic driller was holding it back. Hand feed raised penetration to 84 ft. per hour.

The bit was pulled green at 8,125 ft. The float valve had failed. A second bit in harder formation drilled to 8,285 ft. at 33 ft. per hour. Carbide insert bit in this formation made 25 ft. per hour.



NORTH TERMINAL SYSTEM gathers crude from Lake Maracaibo and onshore concessions and delivers it to Puerto Miranda, a...

New terminal for Lake Maracaibo

By the Staff
of Pipe Line Technologists, C. A.
Maracaibo, Venezuela

IMPORTANT crude-handling and transportation economies will result from Cia. Shell de Venezuela's large terminal storage capacity and tanker-loading facilities recently completed at Puerto Miranda.

It will eliminate the double handling caused by the shallow bar which has required lake cargoes first to be loaded on small shallow-draft tankers. Crude has been hauled to deep-water ports on the Paraguana Peninsula, Venezuela, or in the Netherlands Antilles for transfer to ocean tankers. Completion of a 39-ft. minimum channel through the bar and the Puerto Miranda terminal to take advantage of it will enable Shell to export practically all of its production in the new and larger ocean tankers.

A new 30 and 34-in. pipeline which parallels the coast line from Bachaquero to Puerto Miranda will deliver some of the crudes produced in fields along the coast as well as substantial lake production.

Eventual consolidation of tanker-loading operations at the new terminal will cut costs, require fewer tankers, and to some degree limit construction of additional onshore facilities in areas that could be used for future urbanization.

The project at first will handle some 440,000 bbl. of crude oil per day. The basic design will permit additions which will almost double initial capacity.

Crude-Oil Characteristics

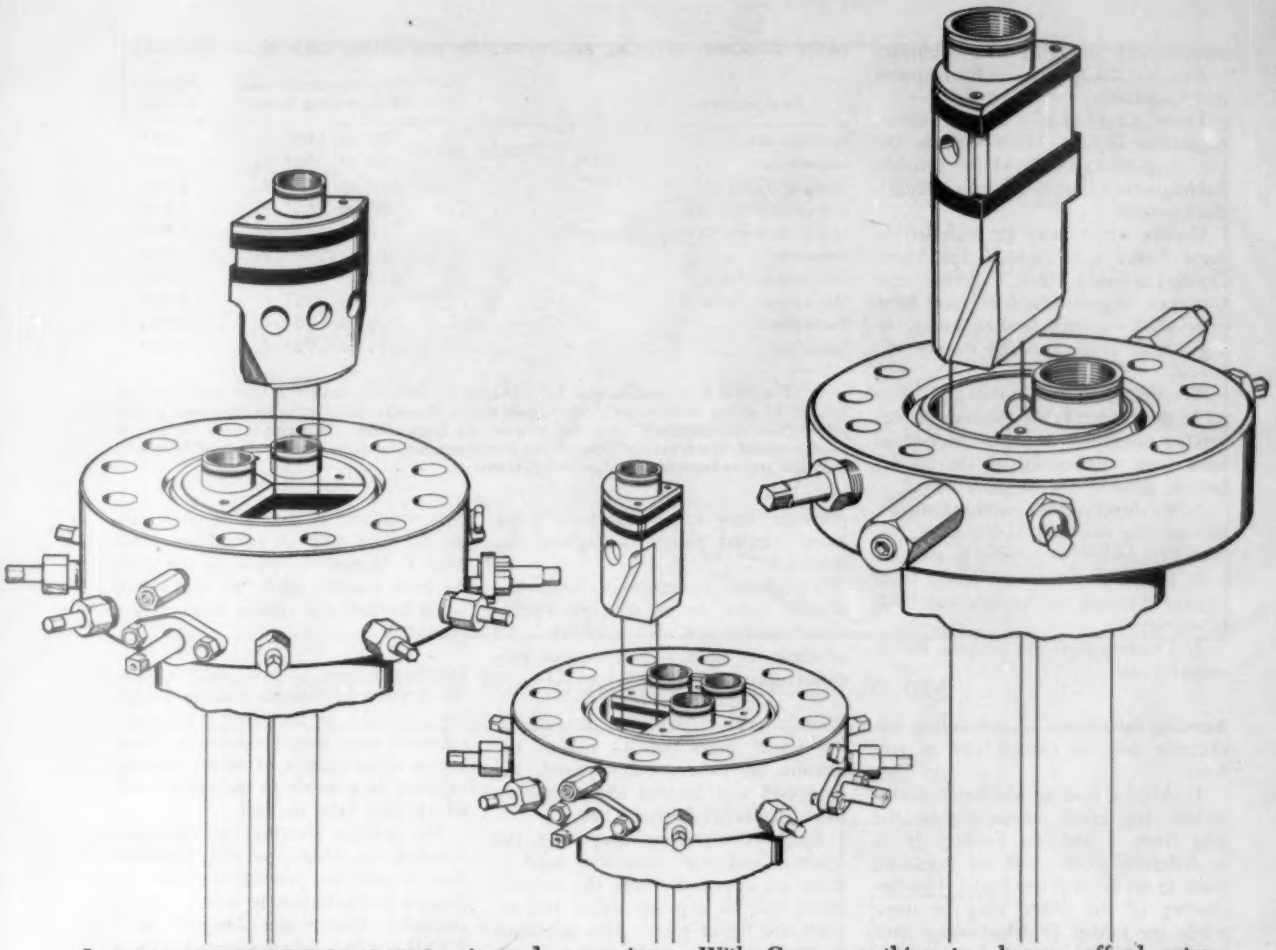
In general, crude oils produced from the fields along the Bolivar Coast are of high viscosity and high specific gravity. They must be heated for pipeline transportation. Lake crudes, on the other hand, can be moved cold. Crude-oil characteristics, as shown in Table 1, have been a major factor in the engineering and design of the pipeline and terminal system.

Puerto Miranda Marine Terminal

The Puerto Miranda terminal is designed to receive, store, and load as many as 13 different grades of crude. Eight of these crudes may require preheating. Storage facilities will eventually include twenty-five 171,500-bbl. floating-roof tanks. Seven loading points on the two finger piers will allow full berth occupancy, but only one finger pier with four loading points will be used at first.

The maximum loading rate for any grade of crude will be 4,000 tons per hour (about 25,000 bbl.) to either one or more ships. The system has been designed eventually to load four different crudes simultaneously at this rate or seven grades at 3,000 tons per hour. The finger piers are designed on the premise that most of the tankers will be in the 18,000-40,000-ton range. But one will have two berths of sufficient size to accommodate a 65,000-dw.-ton tanker.

The following crudes will be han-



A CAMERON SPECIALITY

Multiple Hangers for Multiple Profits

Dual, triple and quadruple producers are great—when they produce the proper profits. But don't overlook the fact that there are differences in various equipment for multiple completions.

Cameron multiple completion hangers, for instance, have design advantages which are the result of constant research conducted to bring you higher profits with safety and convenience. With Cameron multiple completion hangers, strings may be run or pulled independently—you can even run special tools with maximum clearance—under complete pressure control. This is made possible by Cameron's time tested back pressure valves. Every single step of your completion is carried out with the complete safety of our closed pressure method.

Orientation of the segmented hangers is practically fool proof and each hanger when landed will carry full joint strength loads.

Triple seals for final closure leave nothing to chance—afford extra safety at three critical points. Double annulus seals are activated by plastic injection. Steel non-extrusion rings afford positive retention of the self energizing neck seals.

Finally an oil resistant pad provides secondary sealing to prevent pressure from crossing over between each run.

Comparison will prove that these designs offer the safest, most convenient and surely the most profitable well completions on the market today. On your next multiple completion, get the most for your money, get Cameron.

Cameron

IRON WORKS, INC.

P. O. Box 1212—Houston, Texas

Export Office: 7912 Empire State Bldg., New York City. In England: Cameron Iron Works Ltd., 76 Grosvenor St., London W. 1 England.

dled initially through Puerto Miranda:

From Bachaquero — Bachaquero and Lagotreco.

From Lagunillas — Leguna Once, Lagunillas Quince, Mene Grande Oil Co. Lagunillas, and Mene Grande Bachaquero (injected into Shell's Bachaquero).

Crudes which may be included at some future date include Tia Juana Doce, Tia Juana Trece, Lagomar, and Cabimas. Separate facilities have been provided for storing, heating, and loading Boscan crude through Puerto Miranda.

The incoming stream will be directed to the proper tanks through the receiving manifold via 36-in. individual tank lines. Reheating of the crudes can be done in one of three ways:

1. By directing the incoming stream through the two 46,000,000-B.t.u. per hour heaters before routing to storage.
2. By recirculating the crude from storage through the heaters and back to storage.
3. Loading direct to tankers, but at reduced rate.

Loading operations . . . Loading operations will be carried out as follows:

1. After a loading line has been selected, the crude remaining in the line from a previous loading, if of a different grade, will be displaced back to an appropriate tank. The displacing of the crude may be done while the tanker is deballasting, thus avoiding delay.
2. After deballasting, the loading arms and crude headers will be drained into the jetty drainage system. This process will help to minimize contamination of the various crudes—another feature in the terminal design.
3. Depending upon the rate of flow desired, either one or two loading pumps in series will be used to deliver the crude from storage to tanker.
4. A propeller-type flowmeter will be installed in each of the loading lines. These meters will give a reasonably accurate indication of loading rates. Valves installed in conjunction with these meters may be positioned for flow-rate control as required.

Automatic controls . . . At Puerto Miranda, extensive reliance will be placed upon automatic controls to obtain precision in operations.

These controls and all pump switches are brought into a central control room, in the administration building, where they are mounted over an illuminated schematic diagram of the terminal. In addition, remote-reading indicators installed in the control room show temperature, pressure, flow rates, and tank gages from selected points throughout the terminal.

Telephone connections from the control room to all strategic operational points are also available. All of these facilities help to reduce personnel requirements.

TABLE 1—SOME PHYSICAL PROPERTIES OF THE CRUDE OILS TO BE HANDLED*

Designation—	Viscosity-centistokes at pumping temp.	Specific gravity
Bachaquero†	185 at 160° F.	0.979
Lagotreco	120 at 90° F.	0.922
Laguna Once	550 at 165° F.	0.991
Lagunillas Quince	80 at 165° F.	0.958
Mene Grande Oil Co., Lagunillas	70 at 165° F.	0.958
Boscan‡	350 at 210° F.	1.000
Tia Juana Doce	125 at 190° F.	0.985
Tia Juana Trece	100 at 190° F.	0.879
Cabimas	120 at 90° F.	0.922
Lagomar	32 at 90° F.	0.871

*The first five crudes will be transported initially, and the last four may be added at some later date. †Includes Mene Grande Oil Co.'s Bachaquero crude which will be injected into the stream at Lagunillas. ‡Boscan crude which is produced on the western side of Lake Maracaibo, is delivered to Puerto Miranda through an independent pipeline system.

Piers . . . To have 45 ft. of water at the finger piers and to reduce the amount of excavation required, the land end was located about 500 m. from the original shore line.

Spoil removed in deepening the channel and port area was used to build an approach from the original shore line to a point about 100 m. from the finger piers. This approach is about 100 m. wide and is 3 m. above the lake level.

The two fingers and the T-head pier are in the shape of a capital "U" with the T-head pier as the base of the letter and parallel to shore. The fingers are 330 m. long, 30 m. wide, and about 300 m. apart. The T-head pier is connected to the approach by a concrete ramp.

The entire structure is concrete, and extensive use was made of precast concrete. The structure is supported on precast concrete piles with an average penetration of 40 ft. The piles are connected and braced by precast beams. All pipes are supported on the crossbeams. Expansion of pipe is provided for by use of bellows-type expansion joints and suitable anchors.

Electric power is supplied by cables located in cable trenches to switch houses on the land end of each pier. From the switch house, power and control cables are carried in cable trenches located under the perimeter drive.

Bollards and power-operated capstans are conveniently located to permit mooring of tankers. A 500-ton-capacity bollard, separate from the pier structure, is located at each side on the land end. A round-head dolphin is located seaward of the pier. At each loading spot, the customary wood fenders and rubber bumpers are provided.

Loading pumps . . . Nine electric-driven vertical centrifugal loading pumps are included in the design but only six have been installed initially. They are in three groups of three, situated as close as possible to the tanks from which they take suction.

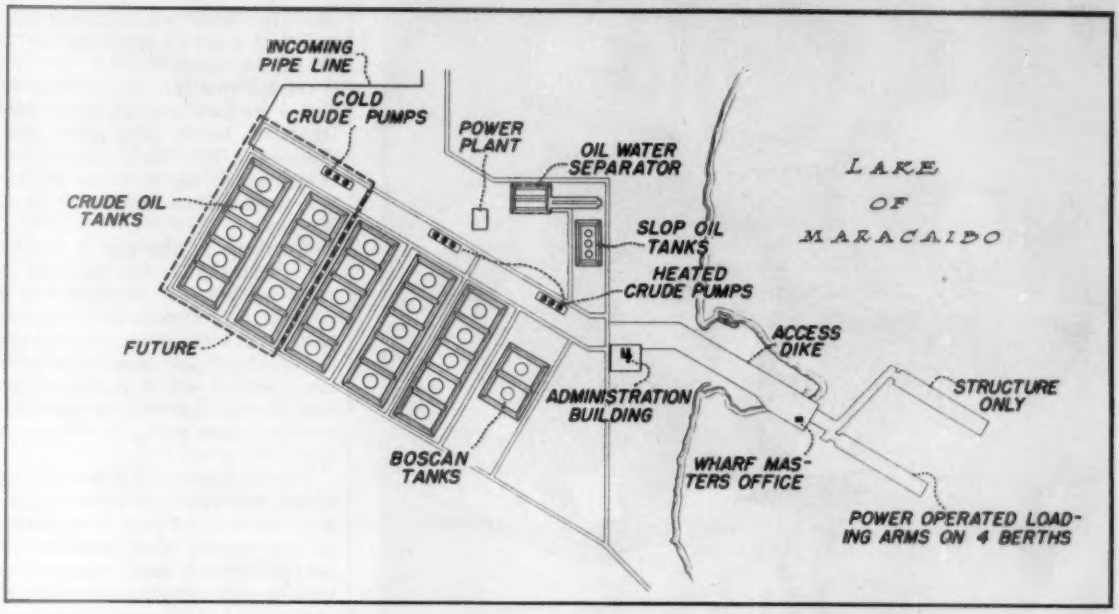
No specific standbys are incorporated in the design, but it is expected that it will be possible to use the pumps indiscriminately when and as required. Pumps are designed with NPSH built in and are situated to have zero pressure at suction flange, at rated capacity, with 7 ft. of head in any tank.

Pumps in the original installation are provided with 750-hp. 720-r.p.m. TEFC motors, but 1,500-hp. 900-r.p.m. motors may be used later. All designs are based on eventual use of the larger motors. Each pump group is installed in a concrete pit and provided with necessary manifold, drain lines, pump-out connections, etc.

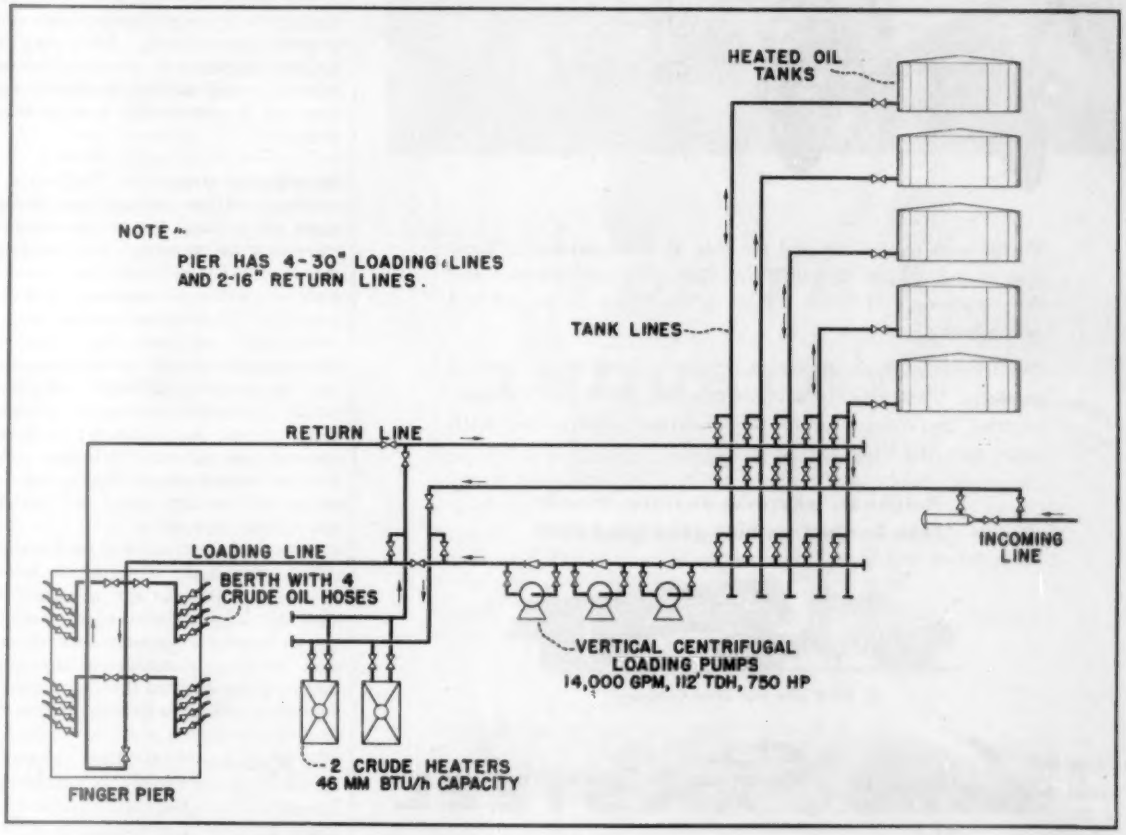
Loading lines . . . Four 30-in. loading lines were installed on the pier that will be in use initially. Expansion of pipelines on the pier is provided for by use of vertical expansion joints. Three additional 30-in. loading lines will be provided when the second pier is commissioned.

In the pipe runs in the terminal proper, all suction lines are 36-in. All pump lines in manifolds are 30-in. Lines from pump manifolds to pier block valves are sized for oil to be handled, but all are at least 30-in.

Loading machines . . . Each pier is designed with four loading machines. Two are Chiksan type with four 12-in. swing lines and one 8-in. swing



This layout permits the Puerto Miranda terminal to use . . .



. . . this crude-oil loading system

THE TERMINAL is designed to handle as many as 13 different grades of crude. Four loading points on one finger pier will be used at first. Seven tankers can be loaded at once eventually. Loading arms may be used for deballasting ships, loading ships with crude, refueling, or unloading cargoes of fuel oil.

Congrats and $25 for this quip to G. A. KRAFT, 19 Van Berwoerdeweg, The Hague, Netherlands

To the men on the rig and the men at headquarters . . . Lone Star casing, tubing, and line pipe mean fine steel stamina and the convenience of quick supply so important in the oil and gas industry.

Quality control is basic at Lone Star . . . from ore to finished products. Ultra modern manufacturing facilities plus multiple, exacting inspections guarantee absolute satisfaction with Lone Star API Pipe.

Neighbor, wherever you are, specify Lone Star and we both get a good deal!

© 1956 Lone Star Steel Company

Lone Star STEEL

COMPANY

EXECUTIVE—SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas
DISTRICT SALES OFFICES
912 Republic National Bank Building, Dallas, Texas
Houston, Texas | Midland, Texas | Tulsa, Oklahoma

line. The other two machines are of the Shell Curacao type and use 10-in. flexible hoses.

On the first pier the Chiksan machines are located at the outer berths which can handle ships up to 28,000 dw. tons. The Shell Curacao machines are on the inner berths which can accommodate ships up to 18,000 dw. tons.

When the second pier is equipped for operational service, the Shell Curacao machine will be located at the east side only at both inner and outer berths which can be used to load ships up to 25,000 dw. tons. The swing-line machines will be located on both sides in the center of the pier which can take ships of up to 65,000 dw. tons.

This arrangement will provide eight berths, but with only seven usable at any one time. Piping is manifolded so that loading arms may be used for deballasting ships, loading ships with crude, refueling or unloading cargoes of fuel oil with a considerable degree of flexibility in simultaneous operation.

The swing-line machines have hydraulically operated loading lines with a 40-ft. power reach. All piping on loading machines is aluminum to reduce the load on the hydraulic system and to provide the least pressure drop.

Deballasting system . . . Tankers will discharge ballast through the loading arms and a 24-in. line to two earthen reservoirs for storage. The entry of the water and oil from the reservoir into an API-type separator will be controlled by means of weir gates.

Skimmed oil from the reservoirs and separators will be pumped into one of three 20,000-bbl. cone-roof tanks for further settling. The clean water from the separator will be drained into the lake. Full slop tanks will be drawn down, the water returned to the separator, and the oil returned to storage.

Automatic controls will be installed on the slop tanks to close the water drawoff at the correct moment. In addition to ballast from tankers, water drawn from storage tanks and all surface drainage from inside the tank dikes will be directed through a closed system to the deballasting reservoirs.

Fire protection . . . Three deep-well turbine-type fire pumps, located in the launch harbor area, will provide fire-main pressure with water from the lake. Two units are electrically driven and one is diesel driven. Fire mains will be kept pressurized at all times with a small positive-displacement pump.

From the fire pumps, water is delivered through a 28-in. main to the south end of the tank farm in the administration area. The tank farm is looped with 16-in. fire mains with 12-in. secondaries along tank-farm roads to supply hydrants. Adequate numbers of standing 2½-in. double fire hydrants and 4-in. truck-service connections are located throughout the terminal. The relatively large diameter of the fire mains resulted from the following design considerations:

1. Foam-generating units will require 150-psi. main pressure for adequate operation anywhere in the tank farm.

2. Adequate water volumes must be available to fight major fires on both the jetties and in the tank-farm simultaneously.

3. Provision has been made for an expansion of the tank farm at some future date, and the fire lines must be adequate to provide the fire-fighting services to the future tank-farm area.

All floating-roof tanks are provided with four 4-in. dry-foam riser pipes designed to apply foam to the annular seal between the floating roof and the shell. Risers are connected through branch lines to a manifold outside the tank dike where a tender truck can be connected.

All cone-roof tanks are fitted with riser pipes for foam applications, each with a fixed vertical branch pipe and accompanying vapor-seal box and nozzle. Premix service lines for the cone-roof risers are also carried to a point outside the tank dikes where a tender truck can make connections with a reasonable amount of safety.

Each finger pier has a 12-in. water main and a 6-in. premix foam-solution line. Fire hydrants and premix hydrants will be spaced about 30 m. apart along each side of the piers. Near the wharfmaster's office a stationary premix proportionator will be placed with piping arranged to service either or both jetties with premix solution. Connections are also provided to inject premix solution from a tender truck.

Dual-purpose Pyrene-type monitors are mounted on each loading machine for fighting tanker and jetty fires with water, fog, or foam. Foam will be available to the monitors through a connection from the premix line. A standard form tender will be stationed at the terminal and will be capable of supplying 10,000 gal. per minute of foam or 1,500 gal. per minute of water. A lightweight dry-powder fire engine will also be available.

Ultimately, a fire-control center is to be constructed and will house all mobile fire equipment and provide

GEM
OF THE
OIL AND GAS
INDUSTRY

Graceful as a pillar in a formal garden . . beautiful (in its own way) as a southern belle in her bouffant best . . Lone Star pipe is truly the aristocrat of the industry.

Lone Star API casing, tubing and line pipe . . crafted by skilled hands and America's most modern steel tools and facilities . . is the pipe the oilman knows he can depend upon.

Quality is apparent in every length . . fine machining obvious in every sparkling, precise thread.

Lone Star STEEL
COMPANY

EXECUTIVE—SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas
DISTRICT SALES OFFICES
912 Republic National Bank Building, Dallas, Texas
Houston, Texas | Midland, Texas | Tulsa, Oklahoma

facilities for maintenance of portable equipment. An office and alarm room will also be located in the fire-control center. Push-button alarm stations will be located along roads in the tank farm and at various other strategic locations. These alarm stations will be connected to a board in the fire-control center which will show, by means of a flashing light, from which post the alarm has been given.

Automatic CO_2 fire-extinguishing systems are provided in all switch houses and relay rooms. Similar protection is provided in the power-generating station. Also, suitable members of various types and kinds of portable fire-fighting equipment will be stored on the jetties, in the harbor area, tank-farm area, power-plant area, pipe alleys, etc.

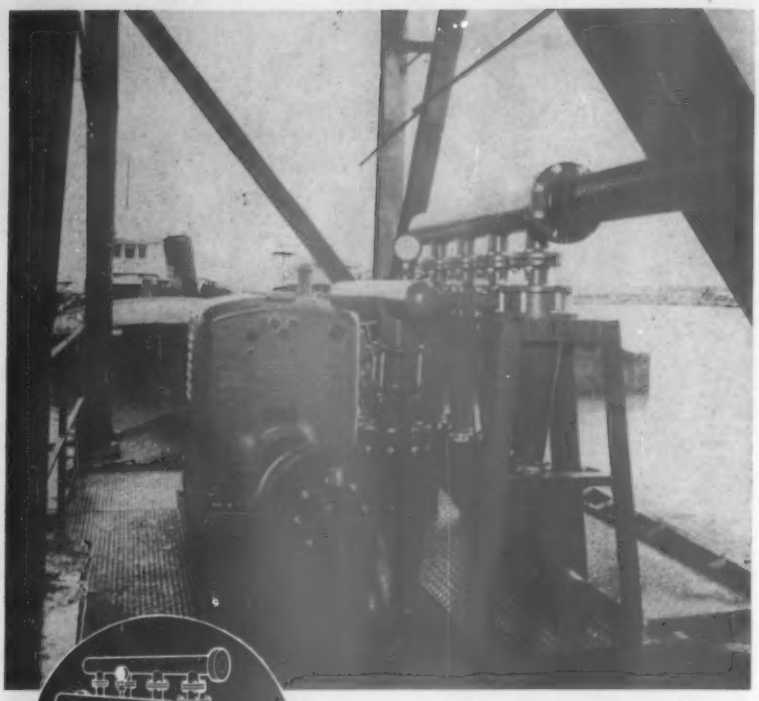
Each large outdoor transformer is also provided with an automatic water-spray protection.

Bunker-fuel system . . . Future bunkering facilities at Puerto Miranda have been designed in the form of two independent systems, one for diesel fuel and one for bunker fuel. Three 80,000-bbl. cone-roof tanks will be provided for fuel storage, one for diesel fuel and two for bunker fuel. In addition, two 3,000-bbl. tanks will be provided as a means for checking the mastermeters which, in turn, will be used to calibrate the loading-point meters at periodic intervals.

Ships will take fuel through a special fuel loader located at each berth and this operation can be carried out at the same time as cargo is being loaded. Four pumps will be provided, two pumps for each fuel system. Normally, when loading either diesel or bunker fuel, only one pump will be operated, although both can be operated in series if additional throughput becomes necessary for the bunkering of several ships simultaneously. Each of these pumps will have a capacity of 6,000 bbl. per hour.

Each loading point will have two positive-displacement meters with ticket printers, one for diesel fuel and one for bunker fuel. The use of meters will make it possible to bunker several ships simultaneously.

Power supply . . . Power for operating loading pumps and miscellaneous terminal equipment will be supplied by an on-site generating plant in which the following major equipment has been installed: two 5,000-kw. Westinghouse gas-turbine generators; one 750-kw. Ruston-Hornsby gas-turbine generator. Space is provided for future installation of a third 5,000-kw. generator when required.



OFF SHORE OR INLAND--
DRILLING COSTS ARE
LESS with the

DEMCO DESANDER

From the Pacific coast to the mid-continent, from the Arctic to Argentina, Demco Desanders have proved their ability to lower drilling costs. Operators everywhere have found these versatile units to be the most efficient, most economical means of controlling sand and solids in drilling mud.

The Demco Desander removes virtually all these solids—in particle sizes from 320 mesh and larger. This reduces mud weight, improves other of the mud properties. Circulation losses are minimized and penetration is faster. Mud and Chemical losses from jetting of pits are held to a minimum. This removal of abrasives also reduces maintenance costs. Bits, pump fluid end parts, tool joints, wash pipes, mud lines and valves *all last longer.*

Major wear surfaces in Demco Desanders are fully protected. Cone liners and under-flow orifices are of ceramic materials which provide maximum resistance to abrasives. Sizes range from the Demco Model 10 single cone unit, with a capacity of 200 GPM, to multiple cone units with capacities up to 1200 GPM. All models are available with or without power and centrifugal pump.

For details or a quotation on a Demco Desander *tailored to your specific needs,* call or write your Demco representative or our Oklahoma City office—today.

DRILLING EQUIPMENT
MANUFACTURING CO.

845 S.E. 29th St. • OKLAHOMA CITY, OKLA.

DRILLING EQUIPMENT MFG. CO. DEMCO OKLAHOMA CITY, OKLA. U.S.A.

Here is a practical use of

Argon-41 as gas-flow tracer

BY R. T. ELLINGTON, W. R. STAATS, AND D. V. KNIEBES
Institute of Gas Technology, Chicago

RADIOACTIVE - tracer-detection equipment is in place on the pipeline. Fig. 1.

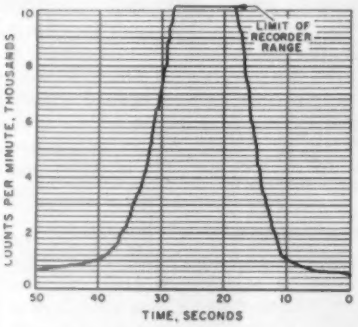
A NEW TOOL has been developed for the pipeline industry.

Argon-41 is a very satisfactory tracer for use in natural-gas flow. The results of the exploratory tests indicate that more work is needed to increase the accuracy of the results obtainable from tracer-flow measurements. Some of this work is planned for 1959.

With such improvement, this method should be usable for spot checking of orifice meters and permit more accurate results from use of ammonia tracer. A quantitative method of detecting the ammonia may eventually be desirable. Trained personnel are available at Institute of Gas Technology (IGT) to help any company carry out argon-tracer tests.

Argon-41 as a tracer . . . Argon-41 is particularly good for use as a tracer in gas streams:

1. Its density is only about twice that of natural gas.



TRACER PROFILE after 30-minute travel time. Fig. 2.

2. Its emission will not induce activity in any other material.

3. It is chemically inert and will not combine with other materials through combustion, hydrogenation, or other petrochemical or food-production reactions.

4. It has a short half life of 109 minutes, and will decay to undetecta bility in normal pipeline transit times.

5. Its emission permits detection of the absolute amount present and thus the concentration profile at any detection point.

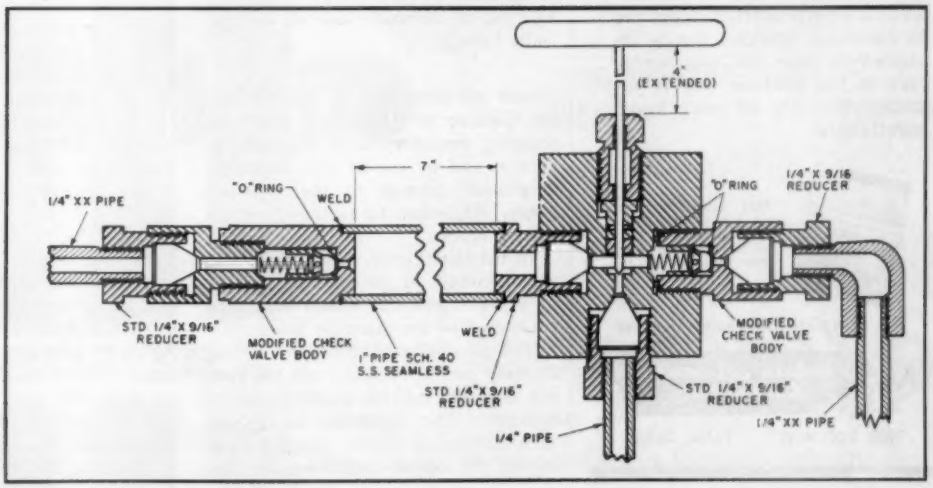
6. Availability of the tracer does not present extreme difficulties.

The safety problem is paramount in the use of a radioactive tracer in a gas stream that will eventually be distributed for public use. In this respect it was judged advisable to go even beyond the rigid standards of exposure set by the Atomic Energy Commission.

For the type of test conducted, approximately 50 ml. of argon-41 at atmospheric pressure was charged to the injection bomb. This was forced into the pipe by use of high-pressure nitrogen.

Radioactive decay, dilution by mixing on injection, diffusion during flow, and dilution during combustion, made it evident that it would be difficult to detect the tracer above normal background radiation after a few hours of transit. Even if a farm tap existed a short distance downstream of the injection point, there would be no danger of customer exposure.

It is also easy to ensure safety of personnel handling the tracer during transport and injection. When the tracer is in the injection bomb, it

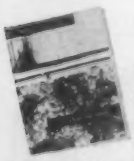


INJECTION-B O M B details are shown. Fig. 3.

STOP CORROSION ON INSIDE OF TANKS

STANDARD MAGNESIUM ANODES WILL PROTECT AGAINST ALL CORROSION INDEFINITELY!

For less than $9.50 per year you can **completely stop** corrosion on the inside of an average 100 barrel tank! Think of the thousands of dollars in replacement costs this will save! Many major companies use Standard Magnesium anodes on waterflood tanks, storage tanks, filters and other vessels where the interior walls are particularly susceptible to corrosive liquids. Easily installed by your own employees, here is the **positive** way to increase the life of your tanks **indefinitely!**



FREE: Booklet describing how you can prevent corrosion on the inside of tanks and other vessels.

For complete information, write

Standard Magnesium Corporation

7502 East 41st Tulsa, Okla.

would decay completely before a person 3 ft. away would receive anywhere near the allowable weekly dosage. Further, it is necessary that all phases of the use of the tracer be supervised by a person properly trained in health physics who can be responsible for the safety of untrained personnel assisting with the test. Two IGT staff members were so trained in 2 weeks by Tracerlab, Inc.

Tracer preparation . . . The amount of tracer needed when the sample is taken from the atomic pile is calculated from the approximate amount of tracer needed to give detectability above background radiation at the detection point. For pipe walls near ½-in. thickness, this should be about 0.4 millicuries. From the estimated transit time in the line section under test, the amount needed at the injection point can be determined. From this and the total transit time from the pile to injection, the total tracer initially required is calculated.

The tracer is obtained by evacuating and filling with argon, separated from the atmosphere, a quartz or aluminum sample cylinder about 1 in. in diameter by 5 in. long. The final pressure can only be slightly above atmospheric. This cylinder is placed in a carrier and pushed into the pile and left for the required time at the neutron flux of the pile to give the desired amount of radioactive argon-41. Quartz sample cylinders were used for this work but aluminum is preferred for future tests.

For transportation to the injection site, the sample must be adequately shielded to insure the safety of all personnel who may come near it. In this case lead cylinders weighing approximately 150 lb. were used. Transportation to the test site may be by any private conveyance when accompanied by authorized personnel. The use of company aircraft is especially helpful.

Tracer injection . . . At the test site, the capsule is transferred from the shipping container to a transfer apparatus and by use of this, from the irradiation capsule to the injection bomb. Radiation turns the quartz a smoky black.

In the initial tests, this transfer was accomplished by placing the capsule in a tygon cylinder which was then connected to the injection bomb.

The capsule was crushed by closing a clamp on the cylinder, and the sample displaced into the bomb by use of mercury. The injection bomb was then connected to the pipeline riser. All of the above operations are carried out from a distance of at least 3 ft. and with a 2-in. lead shield around the tygon tube.

The injection bomb, Fig. 3, consists of two check valves, a three-way valve, and a storage chamber. The tracer enters through the valve, which is then closed for the remainder of the test. The outlet check prevents high-pressure gas from the pipeline from entering the chamber and mixing with the tracer.

The inlet check prevents loss of tracer before connection to the nitrogen supply, and nitrogen from mixing with the tracer until there is sufficient pressure to really compress it. The differential required to open the outside check helps assure injection of the tracer as a small compressed slug with minimum mixing with either the nitrogen or natural gas.

The chains snub the dip tube in case the packing gland slips. Fig. 6 shows the injection bomb in place, and the connecting union being tightened. The extra riser length keeps the tracer a safe distance from personnel making connections and operating valves.

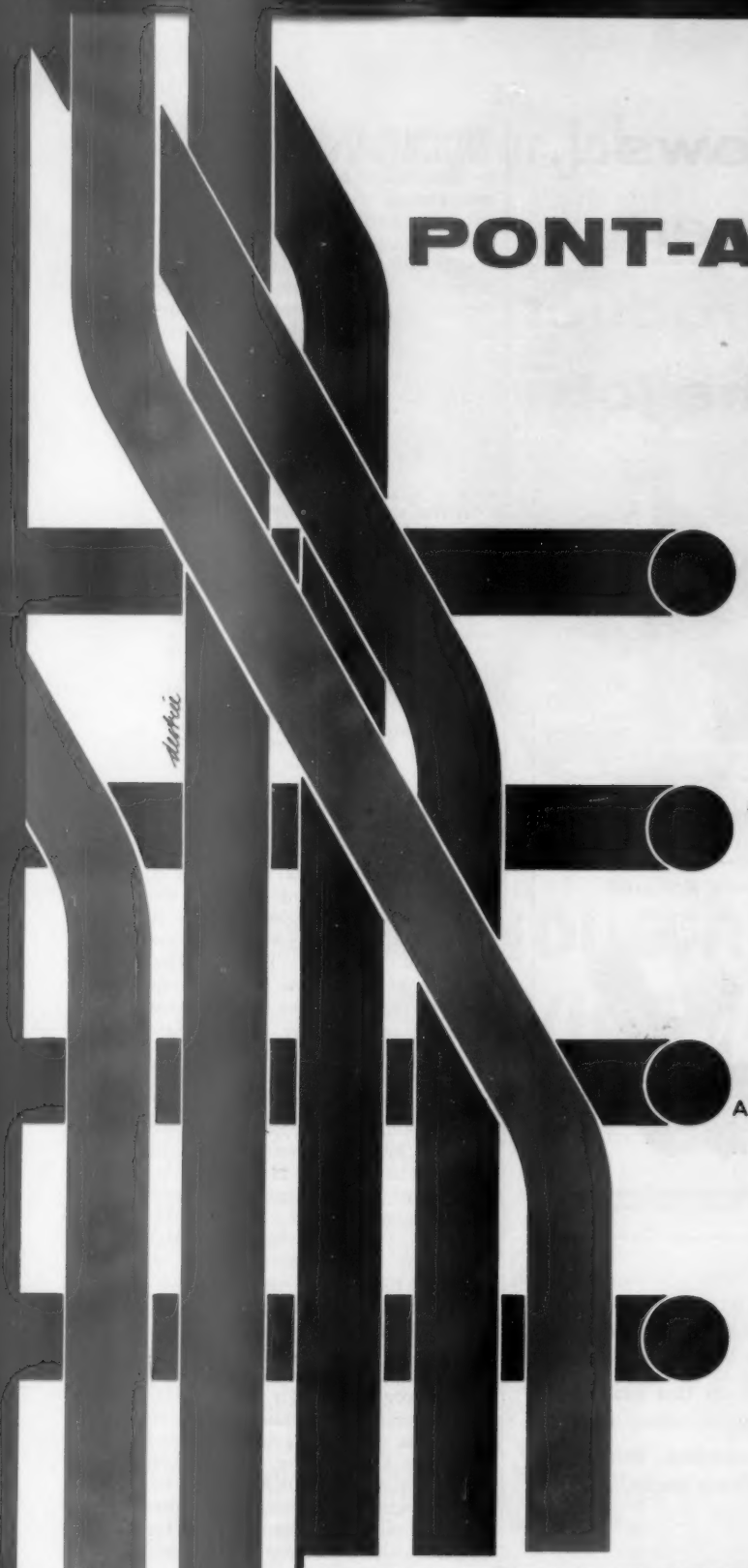
To make the injection, the valves on the gas side of the injection bomb are opened. A geiger counter is used to make a final check that the tracer is in the bomb. The counter is then trained on the injection tube where it enters the riser valve. The high-pressure nitrogen valve is opened rapidly and the time of injection taken as the instant the counter detects the passage of the tracer down the injection line into the pipeline flow.

Tracer detection . . . Tracer passage was detected through the pipe wall by use of a scintillation counter. The scintillation detector was placed in a shielded tube to eliminate as much stray radiation as possible.

This also served to reduce pickup from the tracer before and after it reached a point directly opposite the detector. The shield was mounted on a saddle which lay on the surface of the pipe and kept the probe trained on the pipe axis (Fig. 1). Also shown are the scintillation counter and a rate meter, whose output was fed to a tape recorder and a strip-chart recorder.

Tests and results . . . The injection and detection techniques were proved out during the winter of 1957 at the Crawford Avenue pilot plant of IGT. A 15-ft. length of 26-in. pipe was fitted with a riser, buried, and pressured to 600 psig. Then all injection and detection operations were carried out on the live line.

On June 5, 1958, through the co-



PONT-A-MOUSSON

FRANCE

SEAMLESS PIPE AND TUBES — COMPAGNIE DES TUBES DE NORMANDIE

WELDED PIPE
DUCTILE IRON PIPE
CENTRIFUGALLY CAST — SOCIÉTÉ DES FONDERIES DE PONT-A-MOUSSON

PROCESS PUMPS AND COMPRESSORS — HALBERG

PIPELINE CONTRACTORS — SOCOMAN, EAU ET ASSAINISSEMENT

PONTEX PIPE CORPORATION

SUITE 1317 116 JOHN STREET, N.Y.C

CORRESPONDENT OF COMPAGNIE PONT-A-MOUSSON & AFFILIATES

Gerep publ. PARIS

Wherever oil flows... There's a Dresser® quality piping product that's right for the job

FOR GROOVED END PIPE

Dresser "KUPL + LOK" (TM) Couplings and Fittings, 500# & 1000# types.

FOR PLAIN-END PIPE

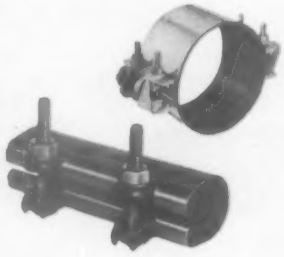
Style 40 Long Sleeves for spanning gaps between pipe ends.

Style 38 Couplings for regular applications.

FOR SMALL DIAMETER PIPE

Dresser Compression Couplings and Fittings . . . Sizes thru 2".

FOR PIPE REPAIRS



"360" Clamp for Asbestos-Cement Pipe "Handiband" Clamp for Steel Pipe

All the pipe joints you need for fast installation on tank batteries, gathering lines, mud pumps, salt-water disposal lines . . . now in stock at your supply store.

All the easy-to-install, permanent repair products that enable you to stop leaks fast . . . now in stock at your supply store.

Insist on Dresser quality when you buy pipe couplings, fittings and repair products. Every Dresser product is clearly marked . . . your guarantee of highest quality.

Bradford, Pennsylvania
Chicago
Houston
New York
S. San Francisco
Toronto & Calgary

DRESSER MANUFACTURING DIVISION

ONE OF THE DRESSER INDUSTRIES

operation of the Panhandle Eastern Pipe Line Co., argon-injection tests were conducted concurrently with ammonia-tracer tests and were monitored by use of orifice meters. The tracer was irradiated at the Argonne National Laboratory, picked up and flown to southern Illinois by IGT personnel in a rented aircraft. A company car was used to complete the journey. Both injection and detection were effected without difficulty.

The flow rates as determined by the three independent means are given in Table 1.

TABLE 1—COMPARISON OF ORIFICE-METER AND TRACER FLOW RATES FROM JUNE 5, 1958, TESTS

Test No.	Tracer	M.M.s.c.f.d. Q_b Tracer	M.M.s.c.f.d. Q_b Orifice meter
1	NH_3	253.61	260.56
2	NH_3	254.11	256.56
3	NH_3	254.54	256.34
4	NH_3	254.21	256.71
1a	Argon	254.01	256.59
5	NH_3	253.64	256.67
2a	Argon	254.51	257.45
6	NH_3	253.66	257.30

From this it can be seen that there is good agreement among the methods. Detailed analysis shows that the rate measured by the orifice meter corresponds to a point ahead of the peak argon concentration. This is at variance with the predictions of the significant work of Taylor.[1] This point, especially, needs to be investigated further, as do the effect of pipe diameter, flow distance, and flow rate on tracer dispersion.

Acknowledgment

This study was supported by the Pipeline Research Committee of the AGA. The counsel and technical assistance of D. C. Benson, chairman, T. H. Beals, Lowell L. Elder, R. M. Galloway, C. W. Marvin, Clinton McClure, Charles E. Schorre, and J. N. White of the Project NB-13 supervising committee are gratefully acknowledged. T. L. Robey and S. J. Cunningham of the AGA gave valuable support in the planning and guidance of the program. Major contributions were made by The Panhandle Eastern Pipe Line Co. and its employes, and especially J. N. White, in providing facilities for the first field tests of the argon tracer and assisting IGT personnel in every way possible. P. Burket of IGT assisted in the pilot and field tests.

Reference

1. Taylor, G., "The Dispersion of Matter in Turbulent Flow Through a Pipe," Proc. Roy. Soc. (London), 223A, 446-68, May 20, 1954.

Whatever your job...wherever you are...

You'll find
FORD INDUSTRIAL ENGINE SERVICE *nearby!*

Ford power users can get the service they need *when they need it* by calling the Ford Industrial Power Headquarters nearest to them.

Located everywhere from coast to coast, Ford Power Dealers offer prompt parts delivery and immediate on-the-job service to help you keep costly downtime at a minimum. Because each dealer carries a stock of normal replacement parts, you need never invest in a large parts inventory of your own. What's more, you get these parts at low cost because of Ford's modern production and distribution methods.

If you need a complete engine or power unit installation, check Ford's full line of dependable engines. These engines range from 134 to 534 cubic inches—including Ford's 220- and 330-cubic inch Diesels. And for really big jobs, there are three Super Heavy Duty V-8's—now available with 5- and 8-speed transmissions and the new 6-speed automatic transmission.

To get the *right* engine for your application—with readily available service that will help keep your operating costs down—select a Ford Industrial Engine.

Ford
INDUSTRIAL ENGINES
AND POWER UNITS

INDUSTRIAL ENGINE DEPARTMENT • FORD Division of FORD MOTOR COMPANY
P. O. Box 598, Dearborn, Michigan

YOUR JOB IS WELL-POWERED WHEN IT'S FORD-POWERED!

▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .

Instruments improve fracturing

. . . of wells by giving both visual and permanent continuous records of fluid-injection rate, well-head pressure, hydraulic horsepower, and ratio of sand to fracturing fluid. The instruments, called Fractometer and Densometer, give the operator and service-company personnel exact information on the progress of the fracturing treatment. The instruments respond and record the data within 10 seconds.

The Fractometer uses a pneumatic pressure pickup to measure wellhead pressure, a flow-meter to measure injection rate in barrels per minute, and a pneumatic analog computer to calculate hydraulic horsepower delivered to the wellhead.

The Densometer reports the ratio of sand to fluid in terms of fluid density. The four readings of data obtained are presented on gages and on a strip chart. Source: **Halliburton Oil Well Cementing Co., Dept. OGJ, Duncan, Okla.**

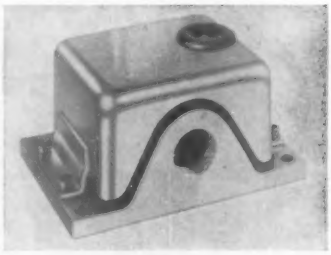
●

Direct current welder promises flexibility

. . . for pipeline and construction welders. The WND welder is driven by a diesel engine. Features include high open-circuit voltage that contributes to easy arc starting and permits the use of a broad range of welding electrodes, including stainless steel, low hydrogen, hard surfacing, mild steel, and high-velocity iron-powder electrodes. Too, its wide-amperage welding range allows the use of smaller electrodes for smaller jobs as well as the use of larger-diameter electrodes for heavy welding as required in pipeline and construction work.

Two models of the welder are made. Model WND-303 is rated at 300 amp. and 40 volts d.c. and has a welding range of 60 amp. minimum at 20 volts to 375 amp. maximum at 40 volts. It is powered by a 42½ hp. engine. Model WND-400 is rated at 400 amp. and 40 volts d.c. and has a welding range of 80 amp. minimum at 20 volts to 500 amp. maximum at 40 volts. It is powered by a 54½ hp. engine. Source: **P&H Harnischfeger Corp., Dept. OGJ, 4329 West National Avenue, Milwaukee 46.**

●



Detector senses vibratory forces

. . . that are destructive in rotating and reciprocating machinery. The Vibra-switch Model 66 is a vibration-sensitive device which, the maker says, is capable of sensing immediately imbalance or high-frequency vibration caused by failing bearings, broken blades, or similar malfunctions.

The device can be wired to activate an alarm or cause a machine to shut down before costly damage occurs. Source: **Robertshaw-Fulton Controls Co., Dept. OGJ, 911 East Broad Street, Richmond 19, Va.**

Want more facts about equipment or copies of product literature described in this issue?

Send this **Showcase Coupon**

to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number:.....

.....

Described in OIL AND GAS JOURNAL - Issue of November 2, 1959

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

AN ANNOUNCEMENT

important to Waterflood Operators

Baker Filtration Company, specialist in industrial filtration, announces a new and highly accurate basis for sizing filtration plants. This is the Baker Filtrability Index (I_{bf}).

"I_{bf}" is based upon data obtained from pilot filtration runs on the raw water at the injection well site. With the resulting Index as a basis, Baker engineering will prescribe a filtration plant to perform the required filtration task most economically. There is no charge for this service.

BF Filters embody unique features to yield the maximum amount of filtration at minimum expense:

DUAL BACKWASHING – "BF" system provides both backwashing and high speed rotary jet spraying for cleaner elements – more effective filtration.

CORROSION-RESISTANCE – The use of compatible metals and synthetics reduces the possibility of corrosion to a minimum, even under the most severe conditions.

COMPACTNESS – BF filtration systems embody the highest capacity for weight and area occupied.

WIDE RANGE – BF Filters range from minimum volume to large unitized waterflood injection systems. The systems are available as manual, semi-automatic, or fully automatic operations.

•

The Baker Filtrability Index is being used extensively in guiding the selection of equipment in new filtration plants. If you are concerned with planning waterflood operations, call or write your nearest Baker representative. He will be glad to talk over an I_{bf} water test for your particular needs.

B
F

BAKER FILTRATION COMPANY

3301 Gilman Road / El Monte, California / Phone: GIlbert 4-4567

Baker Representatives:

James O. Gravitt
P.O. Box 624
Mt. Vernon, Ill.
Phone: 2289

Beckley, Haltom & Hickman
The Americas Building
New York 20, New York
(Export)
Phone: PLaza 7-3276

Velvin Industrial Products
400 East Illinois Street
Midland, Texas
Phone: MUtual 2-2858

Marler Sales, Inc.
1601 Beck Building
Shreveport, La.
Phone: 2-7149

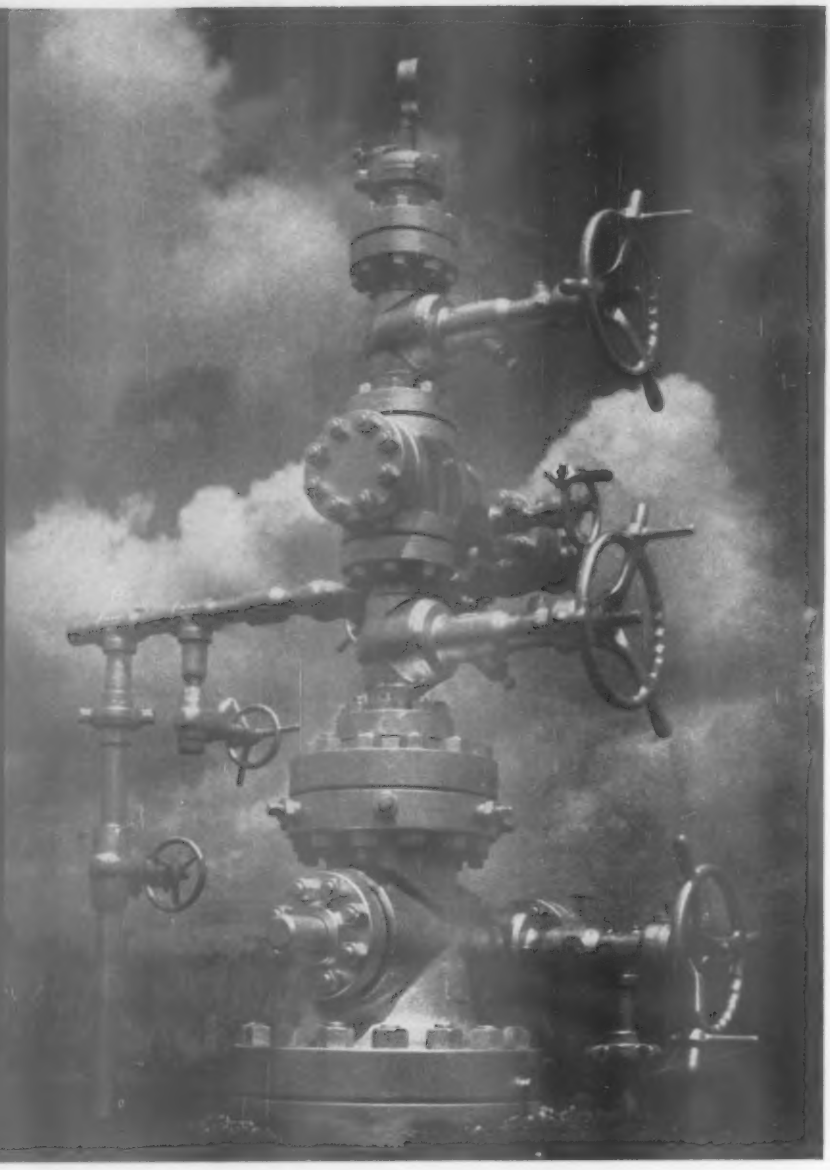
Associated Engineers
P.O. Box 6067
Houston 6, Texas
Phone: CApitol 5-1103

Herb Stough
1706 North Sabin
Wichita, Kansas
Phone: AMherst 5-0321

H. B. Construction Co.
P.O. Box 363
Sterling, Colorado
Phone: LAwrence 2-4707

ORBIT VALVES

for CHRISTMAS TREES and General production service for extra years of service



ORBIT VALVES ARE ENGINEERED AND BUILT FOR CONTINUOUS HEAVY DUTY SERVICE WITH LOW COST MAINTENANCE

Write for Catalog 58-A covering Orbit Valves for Christmas Trees and General Production Use.

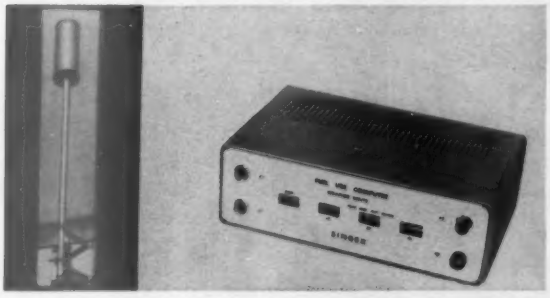
ORBIT VALVES

ORBIT VALVE COMPANY
P. O. BOX 699, TULSA, OKLAHOMA, Phone LUther 4-4761, TWX TU 925
WAREHOUSES: HOUSTON, TEXAS, 407 Velasco, CApitol 8-6623, TWX HO 115; ODESSA, TEXAS, 402 West County Road, FEderal 7-2263, TWX ODESSA TEX 8706; LAFAYETTE, LOUISIANA, 3111 Cameron St., CEnter 4-3326; CASPER, WYOMING, 414 South Elm Street, Phone 2-1324; EDMONTON, ALBERTA, CANADA, 7119-104th St., Phone 391-283. WEST COAST REPRESENTATIVES: Charles Lowe Company, 383 Fourth Street, San Francisco, Calif.; Marshall E. Niedecker Company, 2785 Cherry Ave., Signal Hill, Calif. CANADIAN REPRESENTATIVES: T. R. Pickford & Company, Ltd., Calgary, Alberta, 309 7th Avenue West; Amherst 2-7371. EXPORT REPRESENTATIVE: New York 36, N. Y., 500 Fifth Avenue, BRyant 9-2236.

One-passenger rotary wing aircraft

. . . has been perfected that offers a number of potential uses in the petroleum industry for such jobs as pipeline inspection and patrol, gaining access to mountainous, undeveloped areas, and fast short hops from one job site to another.

The Skycopter Model C can land and take off in 50 ft. It flies with zero wind conditions at a hovering speed of 18 to 20 m.p.h. It cruises at 60 to 75 m.p.h. and can cruise safely at less than 500 ft. If the engine should fail, it lowers to the earth at parachute speed. The maker claims it is the safest aircraft vehicle today. The rotors fold rearward for easy storage of the unit in a garage. Price of the aircraft is about $7,900 f.o.b. factory. Source: **Skyway Engineering Co., Inc., Dept. OGJ, Carmel, Ind.**



Analog computer indicates fuel use

. . . and promises to be particularly valuable to fuel-oil dealers to give them precise, up-to-the-minute means for determining the amount of fuel oil their customers are consuming. The Fuel Use computer indicates average fuel oil consumption continuously under all weather conditions and relays information to an easy-to-read control panel. It is considered more accurate than the degree-day system presently used.

Key components of the computer are a cylinder-shaped analog roof-top unit and a recording console about the size of a portable typewriter. Instruments inside the roof unit create an electrical equivalent or analog condition of heated buildings exposed to weather. Changes in weather condition cause the unit to adjust its energy output to meet the changes. The change is relayed electrically to the recording console where it is indicated in digital readings called "weather units." Cost is about $485. Source: **HRB-Singer, Inc., Dept. OGJ, 90 Schureman Street, New Brunswick, N. J.**

●

Test gage improved for field or lab

. . . and has a 360° linear dial. Movement is calibrated to dial with an accuracy of 0.15%. The 12-in. 360° dial gives the equivalent scale length of a 16-in. 270° dial but is easier to read with high accuracy, the maker reports. The 12-in. gage takes less panel space too.

Bourdon tube is of Ni-Span C. The maker's standard equipment includes

a tube tip bleed for purging and flushing of the tube. Gages are available in capacities from 15 to 60,000 psi. Source: **Martin-Decker Corp., Dept. OGJ, 3431 Cherry Avenue, Long Beach 7, Calif.**

●

Thermodrive actuator improved

. . . by several design refinements which permit stroke and zero adjustments and provide full operating thrust with lower internal pressures. The new model retains the original thermal-release principle that positions final control elements without compressed air, motors, gear trains, pumps, oil, amplifiers, or relays. It has only two moving parts. An electrical-resistance strip heater vaporizes a liquid at a continuous rate.

The Thermo-Drive actuator develops 300 lb. of thrust and has an adjustable stroke span of ½ to 1½ in. An explosionproof housing makes it suitable for Division 1 locations. Source: **Swartwout Co., Inc., Dept. OGJ, 18511 Euclid Avenue, Cleveland.**

●

Seismometer with high sensitivity

. . . combined with exceptional ruggedness is now being made with impedances from a few ohms up to 6,000 ohms. No clamping of the suspension is needed. Natural frequency can be varied from 3 to 10 cycles.

The response curve for the Type 19-L seismometer shows that a 6,000-ohm load is equivalent to a 15,000-ohm internal damping resistor and a 10,000-ohm input load. The case measures 5½ in. high and 6 in. in diameter. Features to note include a low profile that reduces wind pickup and a bottom-of-case location for the lead wires to further reduce wind noise. Source: **National Geophysical Co., Inc., Dept. OGJ, 2345 West Mockingbird Lane, Dallas.**

●

Oil or gas filter for 2,000 psi.

. . . recently disclosed is available for use with up to three filter cartridges with ratings of 5, 25, 50, and 75 μ. The cartridges are felt-impregnated with phenolic resin. A built-in relief valve allows filtered fluid to bypass the filter cartridge if a pressure drop of 15 psi. occurs due to filter clogging. An indicator shows when the filter is being bypassed.

A hammer-union fitting on the filter permits you to change the cartridge quickly without stopping flow. Just close the inlet and outlet bypass valves to cause the relief valve to open, then change the cartridge. Prices range from $106 for a single-cartridge unit to $116 for a three-cartridge unit. Source: **Instruments, Inc., Dept. OGJ, P. O. Box 556, Tulsa.**

New truck made in 140 basic models

. . . and includes 11 gasoline engines with a horsepower range from 113 to 228 as well as 4 diesel engines with a horsepower range from 175 to 220. The basic models include conventional, cab-forward, four-wheel drive, forward-control, and tandem units.

Gross vehicle weights range up to 53,000 lb. while gross combination weights range up to 76,800 lb. The cab-forward models are expected to replace tilt cabs in many operations. One advantage of this type is that it avoids the extra length of conventional models or the extra cost of tilt-cabs. The front fenders swing out 110°, giving access to the engine and accessories. They are hinged at the radiator. The hood opens 90° vertically for access to the engine compartment. Source: **Dodge Brothers Corp., Dept. OGJ, 2751 East Jefferson, Detroit 7.**

TEX-Steamers

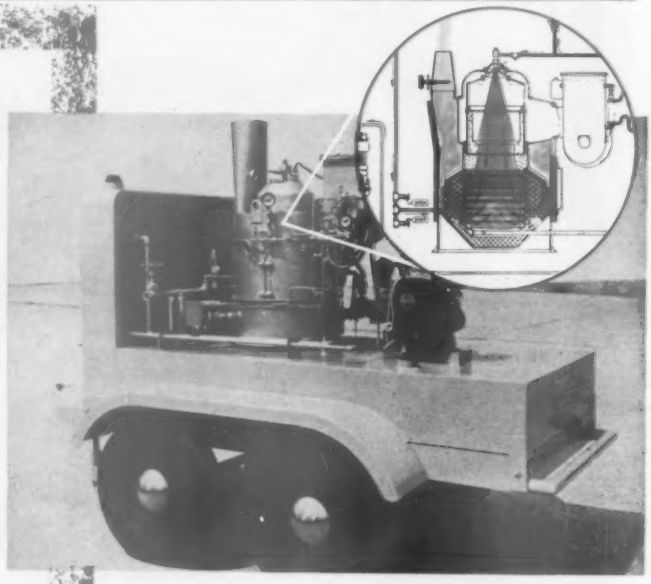
PACKAGED, AUTOMATIC STEAM GENERATORS . . .

Top Efficiency for Oil Country Requirements

TEX-Steamers in all sizes are easily mounted on truck, trailer or skid for mobile use. Packaged design, automatic operation, no pressurized hot water reservoir make steam generation safe and economical under all field conditions.

Contact your Texsteam representative for full information on TEX-Steamers — HP ratings from 10 to 125, standard working pressure range: 75 to 600 psi. Higher steam outlet pressures on application.

May we forward our detailed TEX-Steamer Bulletin No. 100C?



Forced draft fire wipe over water-steam coils . . . steam made only as needed . . . fire burns only when steam withdrawn.

TXT TEXSTEAM Corporation

320 Hughes St. • P. O. Box 9127, Houston 11, Texas • Phone WA 6-6853

A NEW VALVE SEAT IN SECONDS—FOR PENNIES

EVERY TIME A ROCKWELL-NORDSTROM LUBRICATED PLUG VALVE IS LUBRICATED (WHETHER ONCE A DAY OR ONCE A YEAR) IT'S LIKE COMPLETELY RESEATING AN ORDINARY VALVE. *PRESSURIZED* LUBRICANT CREATES A NEW, POSITIVELY LEAKPROOF SEAL ON EVEN TOUGHEST REFINERY AND GASOLINE PLANT SERVICES . . . AND LUBRICATION IS PREVENTATIVE MAINTENANCE FOR LONGER VALVE LIFE AT FAR LOWER COST.

For details on *the complete line* of lubricated plug valves for refinery and gasoline plant services, write: Rockwell Manufacturing Company, Pittsburgh 8, Pa. Canadian valve licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

another fine product by

ROCKWELL

HENRY H. PARIS DISTRIBUTOR, Inc.

OIL WELL, REFINERY AND INDUSTRIAL SUPPLIES

1125 ROTHWELL ST • P. O. BOX 932 • HOUSTON, TEXAS

Agent and Distributor for the Following Nationally Known Manufacturers

ALTEN FOUNDRY & MACHINE WORKS
Lancaster Ohio
Surface Equipment.

MILLS IRON WORKS, INC.
Los Angeles, Calif.
Seamless Swage Nipples, Bull Plugs & Welding Reducers.

DRESSER MANUFACTURING DIV.
Bradford, Pa.
Seamless Welding Fittings, Couplings and Sleeves.

OIL STATES EQUIPMENT COMPANY
Houston, Texas
OSECO Silvertop Fusible Plugs with renewable inserts for all types OIL COUNTRY BOILERS.

THE FAIRBANKS COMPANY
Binghamton, N. Y.
Bronze and Iron Valves.

STEEL FORGINGS, INC.
Shreveport, La.
Weld Saddles.

THE GORMAN RUPP COMPANY
Mansfield, Ohio
Centrifugal Pumps.

VOLCANO BURNER COMPANY
Houston, Texas
Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

HARRISBURG STEEL COMPANY
Harrisburg, Pennsylvania
Forged Steel Flanges and Seamless Casing Couplings.

WESTERN SAFETY BARREL STAND
Houston, Texas
Stand lifts, holds, tilts 55 gal. barrels Prevents spillage—easily loaded.

LOS ANGELES BOILER WORKS, INC.
Los Angeles, Calif.
Welding Caps—Dished & Flanged Heads.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.

SHOWCASE . . .

New Literature

Self-cleaning pipeline strainers

. . . in sizes from ¼ through 3 in. are detailed in new, two-page Bulletin 1210-1 now available. The literature contains a photo of the new Types AT and BT strainers, and adds construction features, ratings, cutaway drawings, dimensions, and weights. Screen information is included. Source: **Sarco Co., Inc., 635 Madison Avenue, New York City 22.**

Bulletin describes heat exchangers

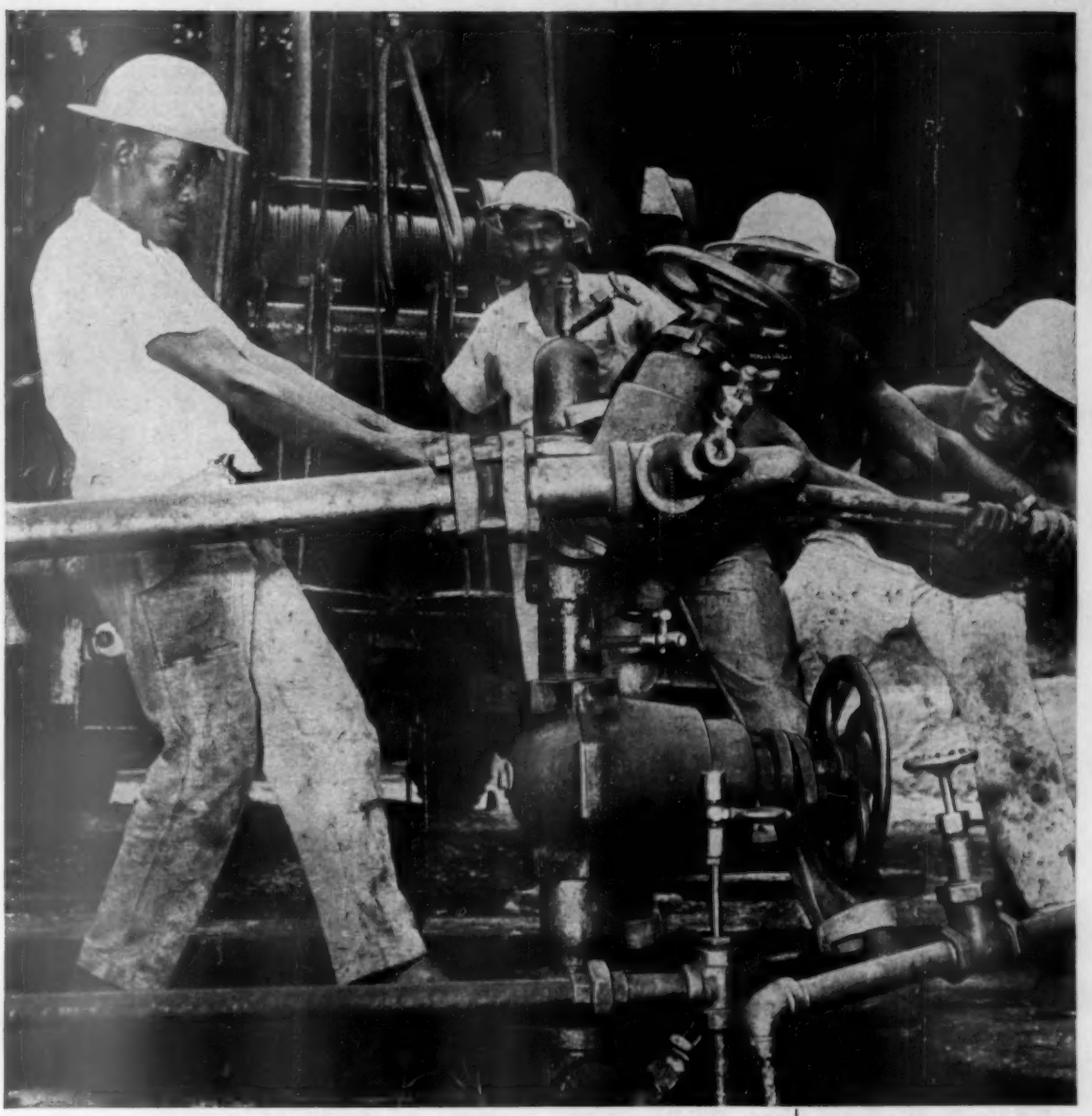
. . . which serve power and process applications for heating, cooling, or dehydrating air and other gases. They are used to remove excess heat from electrical generators, motors, and other equipment; for inplant heating systems; and for heating or cooling furnace gases. Bulletin 11R describes and illustrates the continuous, spiral-wound fins which are crimped to provide extra surface and to promote turbulence. Fins are bonded to the tubes by tinning. The four-page publication shows molded neophene bushings which seal the tubes in tube sheets and absorb differential thermal expansion. Source: **Schutte & Koerting Co., Cornwells Heights, Bucks County, Pa.**

Diesel-driven electric plants

. . . are described and illustrated in new four-page Bulletin F-142. The publication consists of specifications and illustrations of the diesel sets, ranging in size from 3,000 to 6,000 watts (air-cooled), and from 10,000 to 230,000 watts (water-cooled). Diesel-driven marine electric generating plants are also described, together with various accessories and controls. Source: **D. W. Onan & Sons, Inc., 3628 University Avenue, S. E., Minneapolis 14.**

Self-lubricating packings

. . . are detailed in an obtainable 12-page bulletin, which defines Palmetto packings and describes their advantages and applications on pump rods, shafts, and valve stems. Construction features are included. The publication gives quick calculator tables on weights and lengths, along with ordering instructions. Also included are recommended service, uses, tempera-



Trinidad. A production crew carry out service on a wellhead assembly. British Petroleum has a 77% interest in the Trinidad Petroleum Development Company Limited, which last year produced nearly three-quarters of a million tons of oil.

BP

USCOLITE PLASTIC PIPE

CONFUSED ABOUT PLASTIC PIPE?

(MOST EVERYONE IS)

Here's your guide:

U. S. Uscolite® CP acrylonitrile-butadiene-styrene copolymer (ABS-I) pipe is best where maximum resistance to impact is demanded. It will safely handle most chemicals of industrial importance at working temperatures up to 170°F. This is the major plastic pipe used by chemical processing industries.

U. S. Uscolite RV polyvinyl chloride (PVC-I) pipe is best for extremely active oxidizing agents such as strong sulphuric, nitric and chromic acids. This unplasticized, unmodified Type I PVC has high impact strength and handles temperatures up to 140°F, far in excess of normal requirements.

Uscolite HT (ABS-II) pipe is a new addition to the resin-rubber compounds. HT stands for exceptionally High Tensile qualities, plus much better retention of physical properties at High Temperatures.

These types of Uscolite Pipe cover all requirements, not only because they are virtually immune to internal and external corrosion, but they are non-contaminating, odorless, impart no taste or discoloration. Because of these qualities they are approved by the National Sanitation Foundation for carrying drinking water. The use of Uscolite results in a saving of appreciable dollars in installation costs and reduction in man-hours. The skills to install metal pipe are not required to install Uscolite. Assembly can be accomplished in half the time. *Not one foot of Uscolite Pipe has ever failed in service when used in accordance with our recommendations.*

A fourth pipe, *UscoFlow HT (ABS-II)* is a black utility pipe, especially suitable where low first costs are a factor. It's a blend of styrene-base resin and synthetic rubber for good impact resistance and high tensile strength. UscoFlow is the ideal answer to builders and large developers who are seeking long-lived, maintenance-free pipe for plumbing.

We invite detailed inquiries or call your "U. S." plastics distributor. He has the *largest* line of plastic pipe and fittings, plus an experienced background to settle any and all questions about which pipe to use.

Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.

ture limits, sizes, standard packagings, and prices. An applications chart pinpoints the correct type of packing for use with different services. Sources: **Greene, Tweed & Co., North Wales, Pa.**

Mass-flowmeter literature

. . . describes the theory, operation, and advantages of the new Type LB gyro-integrating flowmeter that measures flow of fuels, industrial liquids, and gases directly in pounds. Eight-page Bulletin GEA-6925 offers specifications and dimensions, and cutaway drawings showing operation principles. Source: **General Electric Co., Schenectady 5, N. Y.**

Data-processing applications

. . . now being processed on a pay-as-you-go service-bureau basis are indicated in a new brochure. More than 200 IBM 704-650 computer applications are listed.

The eight-page, 3¾ by 9-in. publication lists typical applications including crude-oil evaluation, flutter analysis, reaction analysis, cut and fill, circuit analysis, and design. Source: **Service Bureau Corp., Dept. OGJ, 425 Park Avenue, New York City.**

Gilsulate at Your Service

. . . is the title of a new 12-page pamphlet which describes the mineral (which is produced from Gilsonites), and explains its many uses. The literature offers installation procedures and insulating values. It also contains information on the checking of piping layouts, soil conditions, and supervision of actual installations. Source: **American Gilsonite Co., Dept. OGJ, 134 West Broadway, Salt Lake City 1.**

Industrial-fan Bulletin L-5

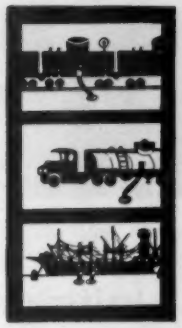
. . . presents fundamental data relating to fan capacities and construction in a 28-page form. Included are complete rating tables for fans, giving volumes of delivered air, revolutions-per-minute, horsepower at various static pressures, and outlet velocity and velocity pressures.

Other tables give correction ratios for deviations from standard-atmospheric conditions at sea level and material specifications. Graphs are used to present a typical fan-performance curve and to represent the friction of air in straight ducts in terms of cubic feet moved per minute.

Principles of good ducting practice are illustrated with nine diagrams. Source: **Lehigh Fan & Blower Div., Fuller Co., Dept. OGJ, Catasauqua, Pa.**

FUELING MADE EASY

with ROYLYN "Non-Spill" COUPLING VALVE



From tank car to tank . . . from tank to truck or ship . . . from tank to tank . . . this "quick" coupling-valve simplifies loading, filling or transfer of petroleum, petro-chemicals and other fluids.

- **ELIMINATE LOSS OF FLUID**
- **MINIMIZE FACILITY CONTAMINATION**
- **REDUCE FIRE AND ACCIDENT HAZARDS**
- **LOWER MAINTENANCE COSTS**
- **REDUCE OVERFLOW SPILLAGE**
- **LOWER EQUIPMENT COSTS**

Write Today for Free Literature

The Best Connections in the World

AIRATERRA

620 PAULA AVENUE • GLENDALE 1, CALIFORNIA

IMPORTANT ADVANCE FROM MOBIL RESEARCH...

1949
1959
Take this up with V.P.-Mfg.
Re: "New Mobil TCC Unit
Points to cover:
1. We can cut mfg. costs + still get same through-put.
2. Over 17% more coke burn-off.
3. Almost 52% less plot area
4. Important—new unit requires 57% less steel, 40% less concrete, 48% less man hours to build.
Get more on this from Mobil.

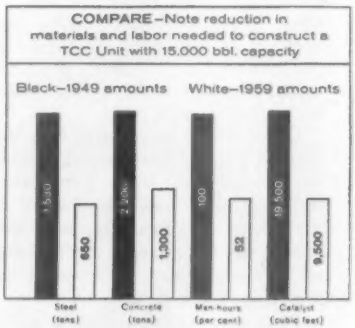
New TCC Units greatly reduce capital investment and operating costs

Since Socony Mobil developed the first Thermofor Catalytic Cracking unit during World War II, Mobil engineers have been steadily improving the basic TCC process and lowering construction costs. The figures speak for themselves—in the past ten years, steel requirements have been reduced by 57%, concrete by 40%, construction man-hours by 48%.

Not only are the new TCC units less expensive to build, operating costs are lower, thanks to Mobil's new bead catalyst, Heavy Durabead. Today's TCC yields more salable products from every barrel of crude oil.

There are many possible over-all processing procedures and cracking yield patterns for a given crude oil. Mobil is prepared to work with a TCC licensee to determine the best plan for his particular needs. Inquiries about TCC should be directed to Process Promotion Department, Socony Mobil Oil Company, Inc., 150 East 42nd Street, New York 17, N.Y.

Lower cost TCC Units . . . Another example of how Mobil research pays off by holding down the cost of gasoline.



Socony Mobil Oil Company

Leader in refining research

Mobil

EQUIPMENT MEN

BJ Service, Inc. appoints three

R. P. Maddox

. . . to the new position of assistant to the sales manager, announces A. M. Birnie, vice president and sales manager of the Borg-Warner subsidiary.

R. P. Maddox, former area sales manager located at Fort Worth, moves to Houston. J. C. Jackson moves from

J. C. Jackson

A. T. Jones

district superintendent at Guymon, Okla., to Tulsa, where he will assume his new position. A. T. Jones, former district engineer in Hobbs, N. M., will work out of BJ Service's Fort Worth offices.

Dan Lewis is appointed

. . . a sales representative for Well Equipment Mfg. Corp., according to John W. Gates, vice president and sales manager. Lewis will locate at Farmington, N. M., from where he will cover northern New Mexico, Utah, Colorado, southern Wyoming, and Nebraska.

Formerly sales representative for Mid-Continent Supply Co. at Casper, Wyo., Lewis completed a special course at Weco's Houston plant before going into the field. As a member of the Weco sales organization, he is also representative for Chiksan Co.'s oil-country products in the same territory.

Homco buys additional property

. . . adjoining the company's 4.7 acres at 2101 South Wayside Drive in Houston.

Z. C. Ambrose, executive vice president of operations, stated that an additional 6.6 acres gives Houston Oil Field Material Co., Inc., a total of 11.3 acres, fronting 636 ft. along Wayside Drive, extending 824 ft. through to Maxwell Lane, and fronting 513 ft. along Maxwell Lane. This gives Homco immediate access to the Gulf Freeway. The property is situated near rail facilities and the Port of Houston.

Ambrose further stated that the acquisition of this property is one of the first moves toward consolidating all company operations in one central location.

Worthington announces a change

. . . in organization at its Buffalo, N. Y. Compressor & Engine Division. The former engine-sales department has now become two separate groups —power-engine sales and engine-compressor sales, both reporting to E. A. Murray, manager of sales and service. Alfred M. Boehm has been appointed manager of power-engine sales, and Howard C. Barten has become manager of engine-compressor sales.

The reorganization took place following the retirement of Willard E. Wechter, former manager of the engine-sales department, who left the company following 36 years service.

Boehm joined Worthington Corp. as a test engineer in the Buffalo Division in 1924. Barten began with the Harrison, N. J. corporation in 1934.

Hughes Tool Co. names two

. . . regional special sales representatives, according to W. H. Siems, general sales manager. Julien Muller assumes the job in Houston. Recently, The Oil and Gas Journal erroneously reported that Muller would locate in Los Angeles. H. T. Oliphant is the regional special sales representative with headquarters in Los Angeles.

A. D. Martin, G. A. Black to meet

. . . several oil industrialists while making a 4½-week tour of the United States and Canada, as part of a general export-expansion program of Martin, Black & Co. (Wire Ropes), Ltd., Coatbridge, Scotland.

Martin, joint managing director, and Black, export director, arrived in New York October 25 after 2 weeks in Canada, and went on to St. Augustine, Fla., October 30. They will return to New York November 3 for 5 days before flying back to Scotland.

Petroleum Distributing Co. opens

. . . its third branch warehouse in Mississippi at Laurel. Clyde Graves is warehouse manager, and Harry Hickman is general manager of Mississippi operations. Other branches in the state are at Brookhaven and Natchez.

Dow Chemical Co. forms division

. . . to handle industrial chemical services, announces Dr. Leland I. Doan, president of the Midland, Mich., company. Known as the Industrial Service Division, it will take over solvent-cleaning functions performed by the company's Dowell Division for many years.

John G. Staudt, executive vice president of Dowell, will be president. John S. Spriggs, staff assistant in the chemicals department, will be vice president and general manager. The division is scheduled to begin operations December 1, with headquarters in Cleveland.

Transfer of district managers

. . . for Denver and Houston districts of Dowell Division of the Dow Chemical Co. has been announced. At the same time, the company reported that its Wichita Falls district office had been closed, and operating points in

E. J. Davis

Jack Sutherlin

the district have been split between Oklahoma City and Midland, Tex., districts.

Earl J. Davis, former district manager at Denver, has been named manager of Dowell's Houston district, replacing Jack Talbot who has been transferred to the company's industrial operations in Cleveland. At the same time, Jack Sutherlin, former district manager at Wichita Falls, replaced Davis at Denver.

W. B. (Silver) Harley will continue to be area manager of the former eastern area of the Wichita Falls district. Sales manager for the area will continue to be H. D. (Doug) Woodard. Eddie Ernst, district engineer for the former Wichita Falls district, is now district engineer for the eastern area. The western area sales of the old Wichita Falls district will be headed by F. J. (Ted) Green, Abilene area sales manager.

Les Barr named sales engineer

. . . of the East Texas and Texas Gulf Coast areas for Edward Valves, Inc., a subsidiary of Rockwell Mfg. Co.,

reports R. A. Durand, Edward sales manager. Barr will represent the company's cast and forged-steel valves. He was formerly with National Supply Co. and Raybestos-Manhattan, Inc.

Shandley acquires half interest

. . . in Rutledge Diesel Supply Co., Wichita Falls, Tex. G. B. Shandley, former service manager in Houston for Stewart & Stevenson Services, Inc., acquired the interest from W. E. Rutledge, Jr.

The company is a dealer in the Wichita Falls area for Stewart & Stevenson, distributor of diesel engines. Stewart & Stevenson is exclusive General Motors diesel distributor in Texas. Later this year Rutledge Diesel Supply Co. will change its name to R&S Diesel Supply Co.

Allis-Chalmers Italiana acquires

. . . the factory and crawler-tractor business of Vender, S.p.A., in Cusano, a suburb of Milan, Italy. The Italian plant employs about 500 people and produces crawler tractors ranging from 60 to 325 hp.

Allis-Chalmers Italiana, S.p.A. is a subsidiary of Allis Chalmers International, Milwaukee..

Clay is appointed sales manager

L. B. Clay

. . . of Joseph T. Ryerson & Son, Inc., Houston, reports Ralph A. Castillo, general manager. A 19-year Ryerson veteran, Loren B. Clay most recently was district sales manager at the company's plant in Los Angeles. Prior service includes 5 years as manager of tubular products and cold-finished bar sales at Seattle and Los Angeles, respectively, and an equal period as a tubing sales representative at Chicago.

At the same time, James W. Provan was named manager of the general order and merchandise inventory department. He was with Vinson Steel & Aluminum Co. from 1956 until 1959, when the company was acquired by Ryerson.

B. O. (Pat) Childs is named

. . . West Coast distributor for Harold Brown Co.'s gas-lift equipment, according to President Harold Brown. The West Coast operation will be known as Harold Brown Co. of California with headquarters in Ventura. Prior to joining the company, Childs was northern division manager for Camco.

Merwin B. Clapp is transferred

. . . from Chicago Bridge & Iron Co.'s general sales staff to the company's Chicago district office as a contracting engineer. He has been with CB&I for 13 years.

Clapp's first assignment was as a design engineer in CB&I's Birmingham plant. He was later transferred to the Birmingham sales office and then to general sales in Chicago.

Robert Forsman named director

. . . of sales and service for Baash-Ross Division of Joy Mfg. Co. Locating at the division's general offices in Houston, Forsman will manage activities of both product sales department and the rental and service department.

Forsman formerly was president of Win-Well Mfg. Co. in Tulsa. Before that, he was a partner in Iron Drilling Co. and was assistant chief engineer of Deep Rock Oil Corp.

OTIS CORROSION SURVEY SERVICES
AND A STEPPED-UP CORROSION MITIGATION PROGRAM
LET US REDUCE OUR WORKOVER COSTS
FROM $500,000 TO $179,000
ANNUALLY. HERE'S HOW WE DID IT.
FIRST, WE USED OTIS CALIPER SURVEYS — BOTH TUBING AND CASING—TO DETECT CORROSION IN OUR PIPE. FROM DATA SUPPLIED BY THE OTIS REPORTS, WE EVALUATED THE CORROSION PROBLEM IN EACH FIELD AND SET UP A REALISTIC WORKOVER PROGRAM. WE REPLACED CORRODED PIPE JOINTS BEFORE THEY CAUSED SERIOUS TROUBLE. THIS ELIMINATED MOST OF OUR EMERGENCY WORKOVERS.
SECOND, WE SCHEDULED PERIODIC OTIS CALIPER SURVEYS TO EVALUATE CORROSION INHIBITORS. WHEN WE'D CHANGE INHIBITORS, OR USE A NEW TECHNIQUE TO APPLY THEM, WE'D HAVE OTIS CALIPER EACH WELL BEFORE WE INTRODUCED THE INHIBITOR AND THEN AGAIN IN FOUR TO SIX MONTHS. THIS GAVE US A CHECK ON THE PROTECTION AFFORDED EACH JOINT OF TUBING IN OUR WELLS — FROM THE BOTTOM TO THE TOP—AND IMPROVED OUR OVER-ALL INHIBITOR PROGRAM.
HERE ARE THE PRIMARY REASONS WE PREFER OTIS' CALIPER EQUIPMENT: THEIR INSTRUMENT GIVES US A DIRECT MECHANICAL READING—LESS CHANCE OF DISTORTION. CLOSELY-SPACED SPRING-LOADED FEELERS PRESS AGAINST THE INSIDE WALL OF THE PIPE TO MEASURE THE PIT DEPTHS. AS PITS ARE ENCOUNTERED, DIRECT ACTION FROM THE FEELERS CAUSES A ROTATING STYLUS TO PLOT THE PIT DEPTH AND LOCATION ON A METAL CHART WITHIN THE TOOL.

Graham is promoted to manager

B. J. Graham

... of the Marketing Division of Johnston Testers, Inc., President D. C. McCann announces. B. J. Graham formerly was assistant to the president. In his new position, Graham will supervise export and domestic products sales. He joined Johnston in 1957.

Blake Equipment Corp. is named

... exclusive sales representative in southern New York and northern New Jersey for Daniel Orifice Fitting Co., Houston. The Blake firm is located in Englewood, N. J.

Colebrook named chief engineer

... of hydraulic drives for National Supply Co. He will be responsible for production designs of hydraulic couplings and torque converters. He will headquarter at Allison Park, Pa., near Pittsburgh.

Ross W. Colebrook joined National Supply last year. He has served in the general engineering department at Toledo and Pittsburgh, and as a development engineer at Houston. Last January he returned to Pittsburgh as senior development engineer.

Sales engineering agency formed

... by R. T. Ferguson to represent Brown Fintube Co. in Southern California. The new agency, with offices in San Marino, Calif., will specialize in applications of heat-transfer equipment for refineries, chemical and power plants, and process industries. It will handle the sale of Brown Fintube heat exchangers, fired indirect heaters, tank heaters, tank suction and line heaters, process heaters and coolers, and custom-built equipment.

Ferguson was formerly sales manager of the process-equipment department, Dravo Corp., Pittsburgh. Previous to this, he was a sales engineer for Lummus Co. in New York. Before his first sales work, Ferguson headed the heat-exchanger design group for Lummus, and was also chief engineer of Graham Mfg. Co. in New York.

Schlumberger shifts R. K. Thies

... to the Texas Gulf Coast division office where he will serve as senior sales engineer. Thies formerly served in the sales department at the company's Houston headquarters.

The firm further announced that J. R. Thompson had been named field sales engineer in Abilene, Tex.

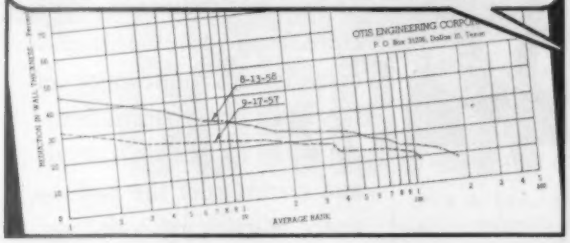
Winston E. Teague is appointed

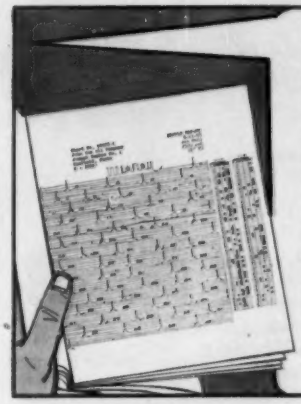
... southwest manager of oil-field sales of Chain Belt Co., Milwaukee. He will headquarter at Dallas. Teague joined the company at its San Francisco office in 1950 where he served on the order desk and later as a sales engineer. In 1955, he moved to Chain Belt's Los Angeles office where he continued in a sales-engineer capacity.

Clark Bros. reports agreement

... with G&J Weir, Ltd., of Glasgow, Scotland, which calls for licensed manufacture by the Weir organization in Glasgow of Clark centrifugal and reciprocating compressors with both

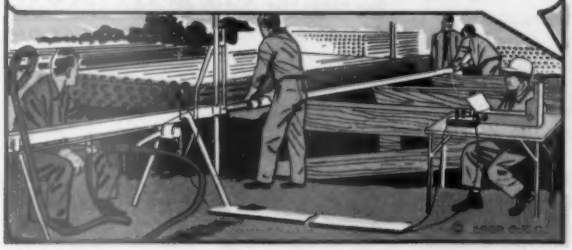
BESIDES LOCATING AND REPORTING DAMAGE TO PIPE THAT WILL CAUSE IMMEDIATE TROUBLE, OTIS' CORROSION REPORT ALSO INCLUDES A "PIT DEPTH RANK CHART" WHICH RANKS THE PIPE JOINTS ACCORDING TO THE DEGREE OF CORROSION DAMAGE DETECTED. THIS CHART ENABLES US TO EVALUATE OUR CORROSION CONTROL PROGRAM, AND HELPS US ANTICIPATE WORKOVERS AND PIPE REPLACEMENT REQUIREMENTS.





WE BELIEVE THE OTIS CALIPER SURVEY REPORT IS THE MOST COMPLETE WE CAN GET. IT INCLUDES — (1) A WRITTEN INTERPRETATION OF THE CALIPER CHARTS; (2) ENLARGED PHOTOCOPIES OF THE ORIGINAL METAL CHARTS TAKEN FROM THE CALIPERING TOOL; (3) A JOINT-BY-JOINT CLASSIFICATION SHEET, AND (4) THE PIT DEPTH RANK CHART. WHAT'S MORE, WE KNOW WE CAN RELY UPON THE INTERPRETATION GIVEN EACH OTIS CALIPER SURVEY.

THERE ARE OTHER WAYS YOU CAN USE OTIS' CALIPER SERVICE TO REDUCE WORKOVER COSTS. HAVE OTIS CALIPER PIPE IN THE YARD SO THAT YOU CAN SEGREGATE THE JOINTS FOR DIFFERENT USE. HAVE OTIS RUN ROD WEAR SURVEYS — AND CALIPER OLD PRODUCING WELLS YOU PURCHASE TO DETERMINE THE CONDITION OF THE PIPE, AND TO LOCATE SUB-SURFACE EQUIPMENT IN THE WELL.



OTIS' CORROSION SPECIALISTS CAN TELL AT A GLANCE AT THEIR CALIPER CHART THE DIFFERENCE BETWEEN PITS, MILL DEFECTS, TUBING COLLARS, OR JUST IRREGULARITIES IN THE TUBING WALL. AND OTIS CAN CALIPER TUBING OR CASING FROM 1¼" UP TO 9⅝". IF YOU WANT TO REDUCE YOUR WORKOVER COSTS AS WE DID — CALL OTIS. LET THEIR CALIPER SERVICE EXPERTS HELP YOU WITH YOUR CORROSION MITIGATION PROGRAM.

OTIS

OTIS ENGINEERING CORPORATION

General Offices: 6612 Denton Drive • Dallas

Branches Throughout the Oil Country

Wiley BOOKS

1. Petroleum Geology

SECOND EDITION

By KENNETH K. LANDES, *University of Michigan.* Three-fourths rewritten, the new edition's theme is the geological occurrence of oil and how it can be found in commercial deposits. Also covers theory of evolution of oil and techniques of exploration. Includes a valuable chapter on reservoir seals, many case histories. *1959. 444 pages. Prob. $10.75*

2. The Sea Off Southern California

A MODERN HABITAT OF PETROLEUM

By K. O. EMERY, *University of Southern California.* Develops relationships among physiography, structure, water, sea life, and ocean sediments—then shows their influence on origin, migration, and accumulation of oil. Ready December 1959. *Approx. 384 pages. Prob. $12.50*

3. Industrial Complex Analysis and Regional Development

A Case Study of Refinery-Petrochemical-Synthetic Fiber Complexes in Puerto Rico

By WALTER ISARD *and* EUGENE SCHOOLER *of the Univ. of Pennsylvania, and* THOMAS VIETORISZ, *United Nations.* Develops a technique for comparing locational advantages and disadvantages relative to the operation of a set of strongly interrelated industrial activities. A Technology Press Book, *M.I.T. 1959. Approx. 336 pages. Prob. $10.00*

TRIAL ORDER

JOHN WILEY & SONS, Inc.
440 FOURTH AVE., NEW YORK 16, N. Y.

1 2 3

Send books circled on 10 days' approval. Within 10 days of receipt I'll remit full price plus postage or return books postpaid.

Name .....

Street .....

City ..... Zone ..... State .....

OGJ 119

motor and gas engine drives. The complete line will be available for purchase in sterling throughout the world through Clark Bros. Co. Division of Dresser (Great Britain), Ltd., London.

Compressors to be manufactured by Weir will have parts which are interchangeable with those of Clark compressors manufactured in the United States and under license in France and Italy. The units manufactured in Scotland will bear a Weir-Clark nameplate.

G&J Weir, Ltd., has global distribution of such units as feed regulators, pumps and heaters, regenerative condensers, deaerators, evaporators, and oil fuel pumps.

J&L Supply Division makes

P. V. Edwards

. . . changes in its Canadian sales force, according to W. L. Wolfe, vice president, sales.

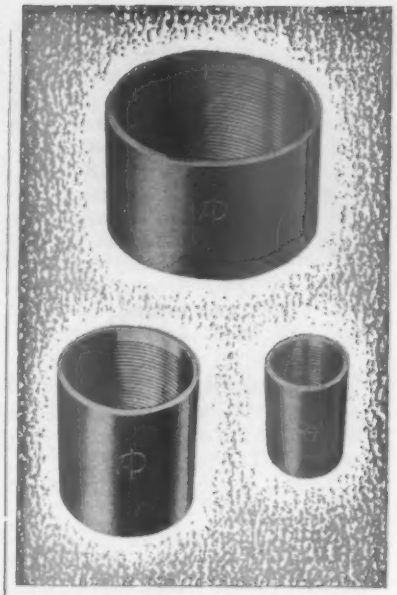
P. V. Edwards, former district sales manager at Edmonton, becomes regional manager for Canada with headquarters at Calgary; R. J. Phibbs, previously a salesman at Calgary, has been named city sales manager at that location; S. D. Martin, another former Calgary salesman, has been promoted to district sales manager at Edmonton; and J. A. Lineham, a salesman at Stettler, Alta., has been assigned to Whitecourt, Alta.

R. J. Phibbs

S. D. Martin

Edwards began his career with Jones & Laughlin as a storeman at Hutchinson, Kans., in 1941. He has held positions as store manager, assistant manager of Canada operations, and district sales manager. Phibbs began with the division as a salesman at Calgary 3 years ago.

Martin, an 8-year company employe, has been a salesman at Estevan, Sask., and Calgary. Lineham joined J&L as a storeman at Edmonton 5 years ago. He was promoted to salesman 2 years after transferring to the Drayton Valley store. Later in 1957, Lineham moved to J&L's Stettler store.



HARRISBURG COUPLINGS

Harrisburg Seamless Steel Pipe Couplings are manufactured to A.P.I. and A.I.S.I. specifications for petroleum and other industries. The Harrisburg developed process assures uniformity of threading unsurpassed in accuracy of form, height, angle and lead. Order the best — order Harrisburg couplings.

More than a Century (H) in Harrisburg 6, Pa.

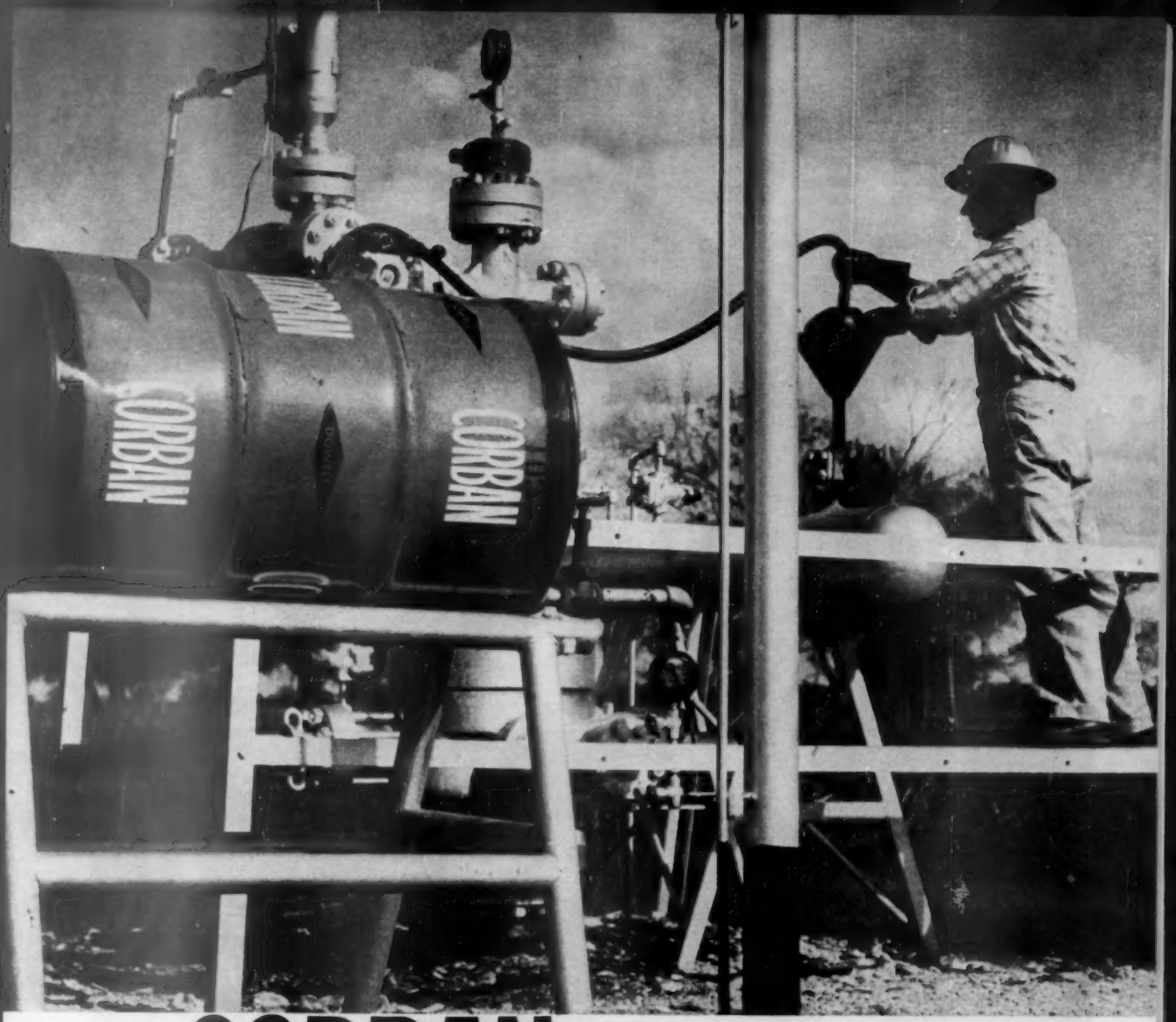
HARRISBURG STEEL CO.
Division of HARSCO CORPORATION

CYLINDERS

FLANGES

TUBES

TRANSPORTS



CORBAN

17 varieties for corrosion control; one quality—best!

Corban® is the name given to Dowell's family group of corrosion inhibitors. They were developed to meet *your* problems. And there is a whole family of them, because corrosive well conditions vary so much.

First, Corban is offered in three forms: "ready-to-use" liquid, concentrated liquid and sticks. Then, Corban comes in more than a dozen formulas, each one designed for sweet crude, sour crude or gas condensate wells.

Corban can be applied by three methods: simple fluid-introduction down the annulus; stick-injection through lubricators or pressure locks; and the "squeeze" method of pumping liquid Corban back into the producing formation—proved for corrosion control over extended periods of time.

A variety of forms and formulas—to meet and control any corrosion problem on any well—is yours when you specify Corban. And, despite this variety, Corban is consistent in *quality*. Ask for an engineered corrosion study and recommendation from any of the 165 Dowell service points and offices. Dowell serves the oil industry in the United States, Canada, Venezuela and Argentina. Dowell, Tulsa 1, Oklahoma.

Products for the oil industry — DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

Smith TOOL CO.

(FORMERLY H C Smith OIL TOOL CO.)

Branches in Principal Oil Centers
Throughout the World

COMPTON, CALIF. • ODESSA • HOUSTON • DALLAS
OKLAHOMA CITY • GREAT BEND • EDMONTON

AOSC selects Voges

The board of directors of the Association of Oilwell Servicing Contractors has named Walter W. Voges as new assistant to executive secretary Jim Danheim, effective in mid-October, J. C. Williams, Jr., president, announced recently.

Voges ,pronounced "Vo-gus") filled the vacancy created by the July resignation of James A. Gobel, Jr., and immediately announced his intention of increasing local chapter participation.

Voges, formerly field man with Texas Pharmaceutical Association, is a long-time resident of Austin, and was born in Lockhart, Tex. He is a graduate of Austin High School, and while in grammar and junior high school,

W. W. Voges

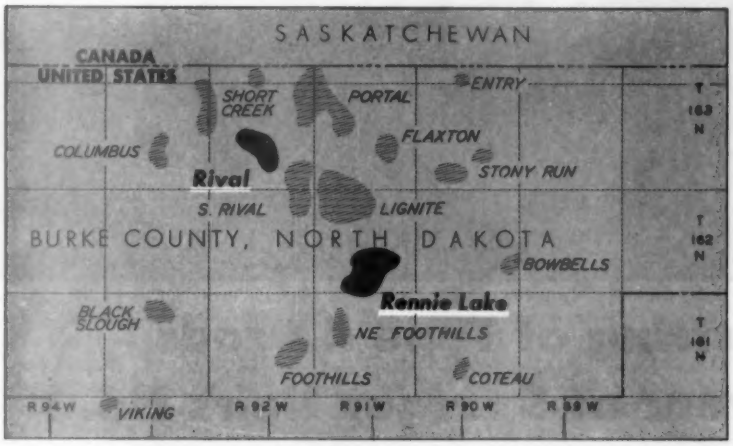
was a page in the Texas House of Representatives. In high school, he was a member of the Texas National Guard.

At 16, he began a 2½-year tour of duty with the U. S. Navy, and served 18 months with the Pacific Fleet in the Asiatic, Pacific, and Chinese theaters. He was honorably discharged upon completion of his tour of duty.

Voges returned from service to train for the Methodist ministry. He enrolled in Southwestern University of Georgetown, Tex., which specializes in that field, and he was active during this period in the ministry and served in several churches as an accepted supply minister.

Unable to complete his proposed education because of a serious illness and the resulting financial pressures, he found it necessary to enter a new field and went into the insurance field as an agent.

Voges rose from agent to district manager for an insurance firm in 3 years. While acting as district manager, he became interested in association work and when the opportunity arose, went to work as field assistant to Max Roesch, executive secretary of the Texas Pharmaceutical Association. He was employed there when he was selected by the board of directors of AOSC.



Active drilling data from this area tell why

Drillers like North Dakota

NORTH DAKOTA is enjoying development activity in several areas. The following two — Rennie Lake and Rival — are typical of the programs that persist in the Sioux State. Here's some recent data on these active-fields drilling reports:

RENNIE LAKE, Burke County

Pay: Madison-Midale and Nesson, 6,425 ft.
Approx. cost of well: Flowing $61,000.
On pump: $70,000. Dry hole: $37,000.
Cost averages: Footage price $4.35
Day: Without pipe, $864

Normal Rig-Time Distribution

% on ft. rate	95	Total days	20
% on day rate	5	Total bits	14

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	520	300
Oil string	4½	6,425	360

Typical Mud Program

Gel, lb.	2,500
Starch, lb.	240
Gyp, lb.	2,000
Lime, lb.	100
Preservative, lb.	700
Phosphate, lb.	100
Cottonseed hulls, lb.	500
Oil, bbl.	150

Avg. Formation Tops (Drlg. Depth, ft.)

Midale	6,300
Nesson	6,325

Core Data

Madison-Midale, 25-ft. interval; 1.9 md. perm; 20.6% por.; 19% resid. oil sat.; 40% total water sat.; est. rec. 110 bbl./acre-ft. gas expansion

RIVAL, Burke County

Pay: Madison, 6,200 ft.
Approx. cost of well: Flowing $75,000.
On pump $90,000. Dry hole $45,000.
Cost averages: Footage price $4.30
Day: With pipe $975; without pipe $890

Normal Rig-Time Distribution

% on ft. rate	90	Total days	16
% on day rate	10	Total bits	16

Casing Program

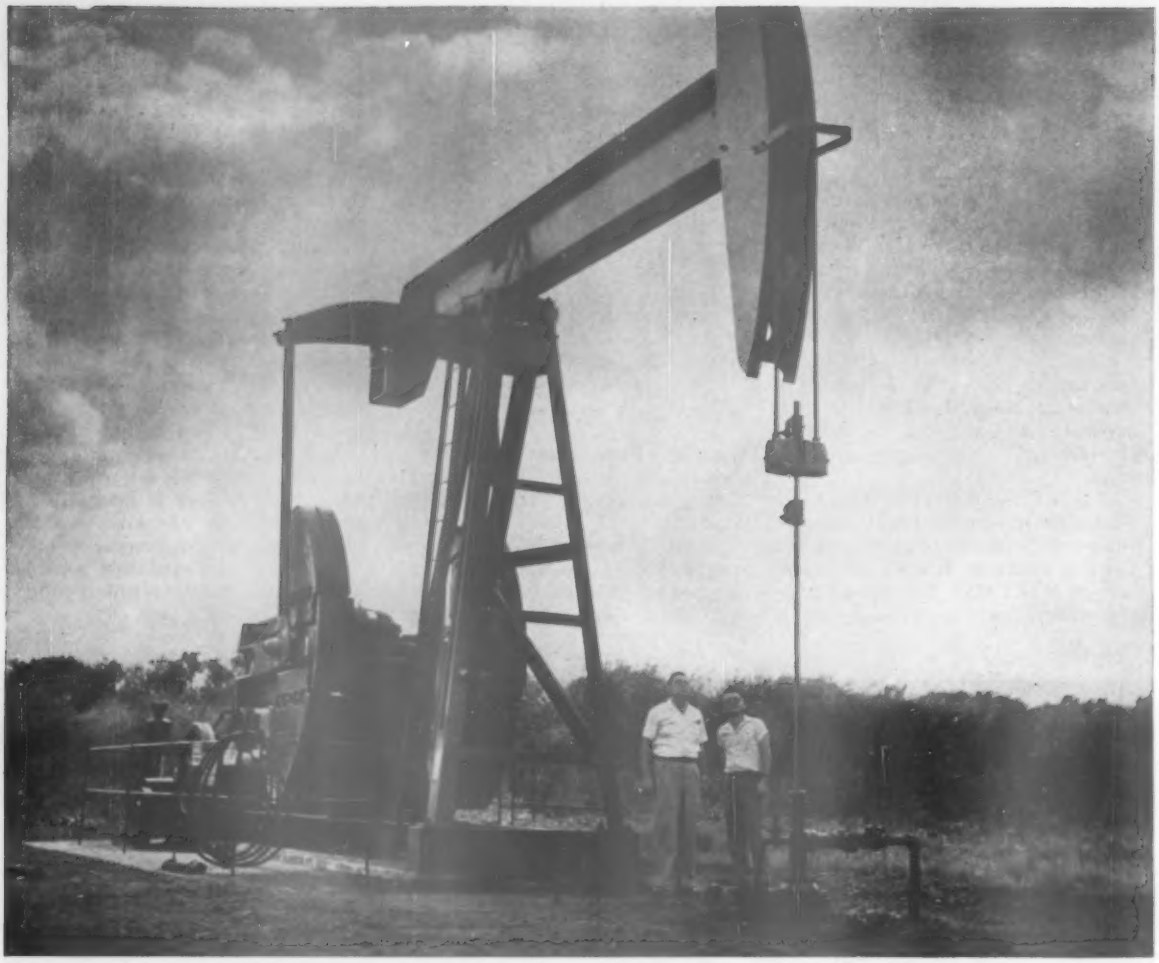
	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	550	450
Oil string	4½	6,140	250

Typical Mud Program

Water gel to 5,000 ft., sacks	15
Gyp, sacks	20

Avg. Formation Tops (Drlg. Depth, ft.)

Madison-Midale	6,110
Madison-Nesson	6,140



8175-ft string of Type 43 rods starts fifth year at Spargur Heirs No. 1

NO BENT OR KINKED RODS WITH BETHLEHEM PACKAGE

Bethlehem Sucker Rods come bundled in a unit package of 80 or 100 rods. Grooved steel spacers cradle rods, protect them from damage during shipment and handling. Package can be lifted easily, thus saving handling time.

Operated by Sun Oil Company, the Spargur Heirs No. 1 Well pumps from 8185 ft, using a tapered string of Type 43 rods: 6050 ft of ¾ in. and 2125 ft of ⅞ in. In steady service for over four years, these rods are still going strong.

Located in the Short Junction Field, southwest of Oklahoma City, this well pumps from the Hunton lime formation. It produces 10 bpd of 34-gravity oil, and 5 bpd of water. The pumping unit, a Bethlehem 320D-30S-120, operates at 5 spm, using a 120-in. stroke.

The Bethlehem Type 43 rod is a high-strength rod, made of nickel-chromium-molybdenum steel. It is normalized and tempered, and is recommended for extra-heavy loads in wells which are effectively inhibited against corrosion.

In addition to the Type 43 rod, Bethlehem produces three grades of carbon and alloy rods to enable operators to meet a wide range of pumping requirements.

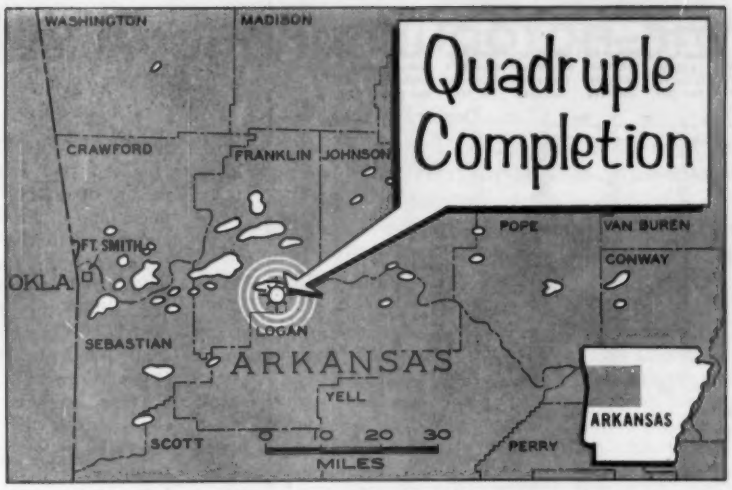
If you have any question about which type of rod would be most economical for any given well, talk it over with your Bethlehem sucker rod distributor. Or drop a line to the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



FIRST QUADRUPLE COMPLETION in Arkansas history has emphasized the rewards to be found in Pennsylvanian sands of the Arkansas Valley basin. Aetna field, Franklin County, is the site of the new four-sand gas well.

Arkansas basin test taps four sands

BY FRANK J. GARDNER

MORE AND MORE, the Arkansas basin shapes up as a source of "big gas" for future exploration.

This two-state bowl astride the Oklahoma-Arkansas border probably has more names than any other province in the country; it has been referred to as the "McAlester basin," the "Oklahoma-Arkansas basin," the "Arkansas Valley basin," the "Coal basin," and the "Arkoma basin," to list a few. Arkansawyers prefer to call it the Arkansas Valley basin, and this is pretty close to the designation shown on the AAPG's Tectonic Map of the United States, where it is dubbed the Arkansas basin. So for the present, Arkansas it must be. By any other name, it still would reek of gas.

Four sands . . . The gas potential of the area was heavily underscored last month when Athletic Mining & Smelting Co. reported the first quadruple completion in Arkansas history. As operator for a group composed of itself, Continental Oil Co., Carter Oil Co., and Stephens Production Co., Athletic finished the well on the southeast flank of Aetna gas field, a large structure on the Franklin-Logan county line.

The new multiple-pay well, the 1 Ernest Carpenter, lies in Section 23-8n-27w in Franklin County. It is producing from four sands in the Atoka-Pennsylvanian section. From the upper Carpenter sand at 1,739-61 ft., open-flow gas gage was 1,800 M.c.f. per day, with surface pressure of 573 psi. Lower Carpenter sand was perforated at 3,440-88 ft. and gaged 5,400 M.c.f. with surface pressure 870 psi. The Cecil series (Barton zone) registered the smallest flow with 440 M.c.f. and surface pressure 1,090 psi. from perforations at 6,030-47 ft. Finally, the Orr sand at 6,791½-6,827 ft. was gaged at 4,000 M.c.f. with surface pressure 1,559 psi. The total calculated open flow figures out to 11,640 M.c.f. per day.

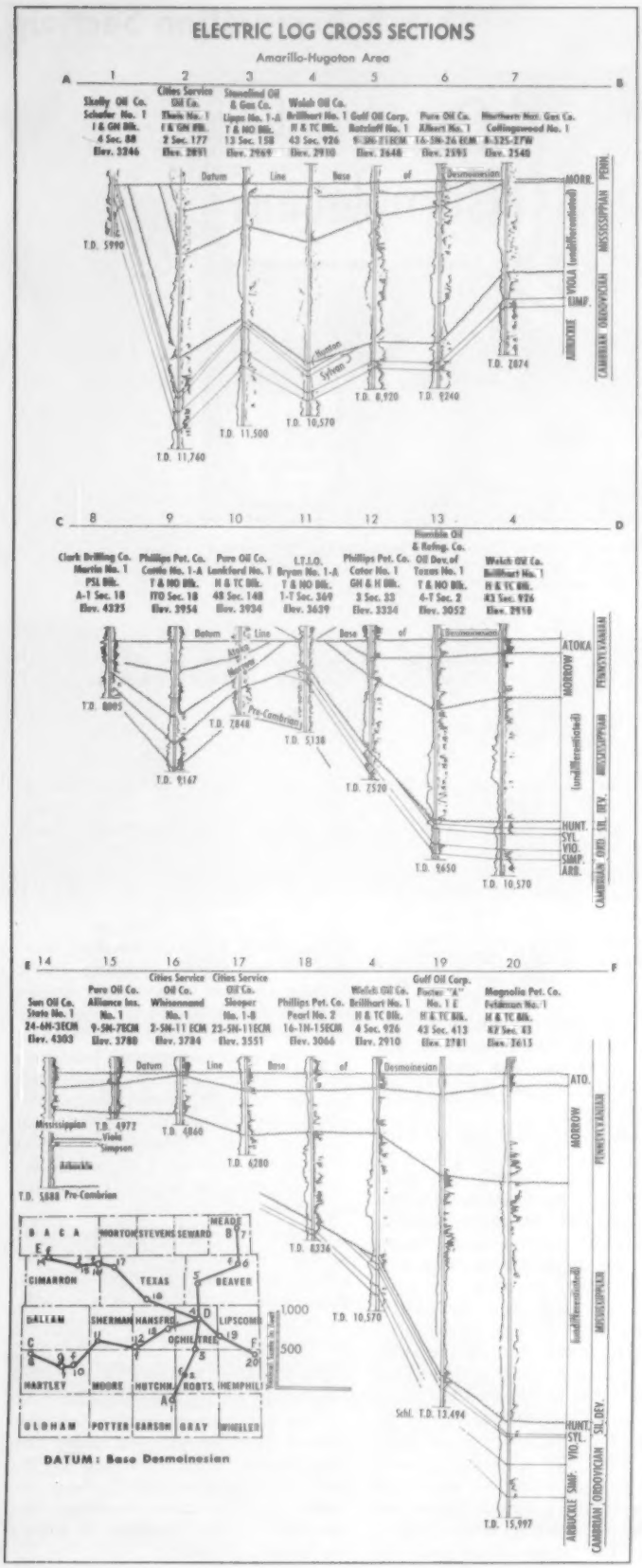
Two sands, the Cecil and the Orr, were treated with acid petrofrac. "Consequently," Athletic reported, "with much of the fracture fluid still in the formation, the open-flow capacity has not reached its maximum and will not do so for some months to come."

Athletic 1 Carpenter was drilled with cable tools by Rox Drilling Co. to 3,437 ft.; at that point, Wolfe Drilling Co. moved in wtih a rotary and drilled to 7,157 ft., where Fleet Drilling Co. took over and drilled to total depth 7,355 ft. Spudded on October 18, 1958, the operation required 11 days short of a year to complete; it was shut down a couple of times, wtih the first shutdown lasting nearly 2 months. The final completion was achieved with two strings of tubing; the two upper zones produce through the annulus of casing strings.

Make Aetna a plum . . . Aetna field, the scene of this quadruplet gasser, is one of the choicer plums in the Arkansas basin. In its earlier days, however, it was not so tempting. Ozark Natural Gas Co. drilled eight shallow wells on the east-west trending anticline between 1927 and 1943; of these only two were commercial producers and they were later abandoned. But the field really began to attract attention in 1955 after the completion of Athletic et al, 1 Mantooth (Section 15-8n-27w). This was a triple completion and gave the impetus needed for exploitation of the field.

Today, there are 11 gas producers in the field, each drilled on a 640-acre pattern. The gas goes to Arkansas-Louisiana Gas Co.'s newly finished 16-in. pipeline. Of special interest is the fact that only one single-zone well has been finished, all others being multiple-pay holes.

This development on the Arkansas side of the basin, plus interesting new deep sands being uncovered to the west in Oklahoma (OGJ, Aug. 10, 1959, p. 143) serve to project this province to the forefront in today's exploration picture.



Here is . . .

A subsurface

IN CROSS-SECTION, the Amarillo-Hugoton area presents an interesting picture of rapidly steepening dips and thickening of formations.

Cross-section A-B (Fig. 5) extends from the north flank of the Amarillo uplift (well 1) northeast to a shelflike area within the Hugoton embayment (well 7). A general deepening to the south is noted. This deepening trend is greatest in well 2, the Cities Service 1 Theis, and serves to locate the synclinal axis of the Anadarko basin. A reversal in this structural trend is found in well 3, the Stanolind 1-A Lips. This reversal illustrates the mid-basin structure underlying Lips field.

There is an apparent updip truncation of Hunton and Sylvan units between wells 4 and 5. There is also structurally controlled thickening and thinning of the Hunton group in wells 2 and 3. Both of these features substantiate the proposed pre-Mississippian erosional surface.

Both post-Mississippian and pre-Desmoinesian unconformity surfaces are indicated in wells 6 and 7 by the subcropping of Atokan rocks and by Desmoinesian strata unconformably overlying a thin Morrow section in well 7. The pre-Desmoinesian unconformity is further substantiated between wells 1 and 2 where Desmoinesian rocks overlie progressively older units.

Cross-section C-D extends from the Anadarko basin area (well 4) west across the Cimarron uplift (well 11) to the western edge of the Dalhart basin (well 8).

In general, pre-Pennsylvanian units thicken eastward as the axis of the Anadarko basin is approached. Pennsylvanian Morrow and Atoka rocks thicken into the basins, thin toward the basin edges, and are missing across the Cimarron uplift where Missourian rocks lie unconformably on Mississippian strata.

A pre-Mississippian erosional surface is indicated by subcropping Hunton, Sylvan, Viola, and Simpson rocks and the westerly overlapping relationship of the Mississippian System to these units.

Cross-section E-F extends from an area within the limits of the Anadarko basin (well 20) northwest across the Keyes dome (well 16) to the north-

ELECTRIC log cross-sections of the Amarillo-Hugoton area. Fig. 5.

BY JOHN A. WORDEN
Shell Oil Co.

look at the Amarillo-Hugoton area

Last week, Part 1 of this article covered the structural expression of the Precambrian and pre-Pennsylvanian surfaces of the Amarillo-Hugoton area.

In Part 2, the author examines the subsurface conditions of the area, using three cross-sections and an isopachous map of the Morrow-Pennsylvanian.

west part of the Dalhart basin (well 14).

All units, except for the Atoka series, exhibit an uninterrupted thickening trend to the south and east approaching the Anadarko basin. The Atoka series thins markedly across the Keyes dome and then thickens to the southeast along with the other units.

The pre-Mississippian unconformity surface is again indicated by truncated Hunton and Sylvan rocks between wells 4 and 18.

The Morrow Series

An isopachous map is a planar representation of the varying thickness of a particular stratigraphic unit. The variation in thickness of the unit is illustrated by the use of contour lines connecting points of equal thickness. The writer visualizes three major factors which control and affect the thickness of any given rock unit.

The first of these factors is the topographic expression of the surface underlying the unit in question. Both structure and erosion affect the interface by developing high and low areas on the surface. Any unit generally attains a greater thickness where deposited in depressed areas and conversely thins over high areas.

A second factor controlling the thickness of a unit is the tectonic setting, which involves proximity to source as well as comparative relief between this source and site of deposition. The sediments deposited immediately adjacent to an uplifted source tend to thin away from the source with a general decrease in clastic content. Furthermore, the probability of a thicker section of coarse clastics near an uplifted source is increased proportionately with an increase in the comparative relief between the source and the site of deposition.

The third major factor controlling the thickness of a unit is postdepositional erosion. This may remove a portion of the unit with a resultant thinning.

If the isopachous map presented here is compared with the contour maps in Part 1, a similarity in general configuration will be apparent. From this, the writer infers that the major thickening and thinning trends of the units were controlled primarily by structure, and that these structural controls were effective as early as Cambrian time.

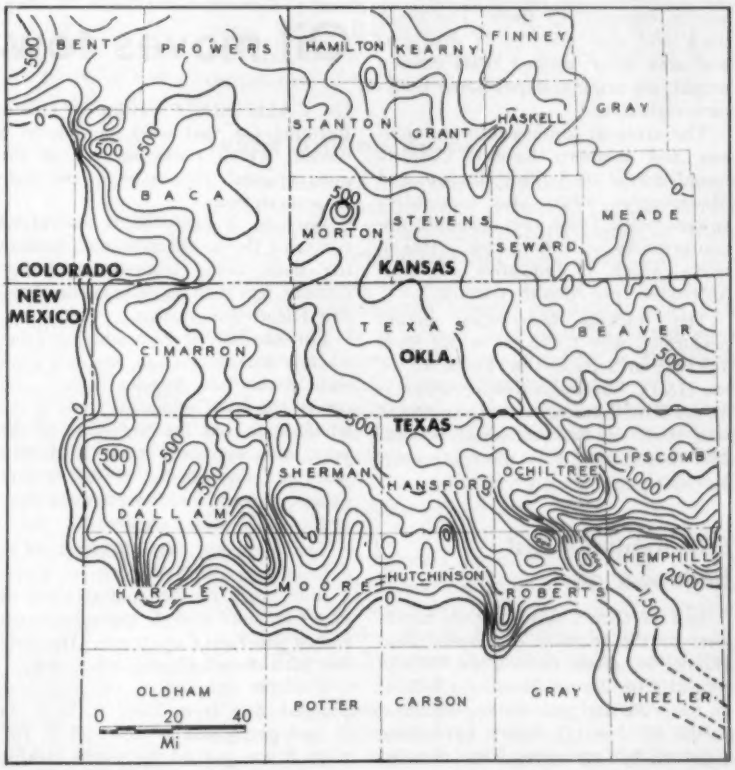
Morrowan deposition on a pre-Pennsylvanian erosional surface later modified by post-Morrowan erosion produced a varied thickness pattern for the Morrow series (Fig. 6).

A regional thickening to the south and east is indicated. The undulating zero isopachous line in the extreme northeast part of the area may represent a postdepositional erosional pinchout; however, there is no conclusive evidence that it was never deposited.

The line of maximum thickness noted in the southeastern part of the area can be extended northwest into Texas County, Oklahoma, and the extreme southwestern counties of Kansas. This zone of thicker section represents the area occupied by the Hugoton embayment. This embayment is considered to be a structurally controlled, shallow basin.

Morrowan strata bend abruptly to the west across the top of Las Animas County in Colorado where a similar wasterly reentrant has been noted for several older Paleozoic units. This is believed to represent a structural sag between the Sierra Grande uplift and the Las Animas arch.

The zero isopachous line in the



ISOPACHOUS MAP. Morrowan deposition on a pre-Pennsylvanian erosional surface later modified by post-Morrowan erosion produced a varied thickness pattern for the Morrow series. Fig. 6.

western part of the area may be the result of nondeposition across a low-lying ancestral Sierra Grande land mass or post depositional erosion and modification.

East of this zero line is a region of general thickening which extends from Baca County, Colorado, south to Hartley County, Texas. The line of maximum thickness for this area strikes north-south. This area of thickened section reasonably outlines the limits of the Dalhart basin.

East of this Dalhart basin area is a north-south trending zone of thin Morrowan rock. This thin Morrowan section is overlain by the Atoka series except in southwestern Sherman County, Texas, where the Missourian series rests on Mississippian strata. Most of this Morrowan thinning is attributed to limited deposition and possible postdepositional erosion across the pre-Morrowan Cimarron uplift. That area in southwestern Sherman County has been described at a product of nondeposition and erosion which continued as late as post - Desmoinesian pre - Missourian time.

Limited deposition or erosion across the late or post-Mississippian structures described in northern Roberts and Hutchinson counties, Texas, could account for the thin Morrow section encountered there. The other thick and thin features in this general area have resulted from erosion amplifying original depositional thickness variations.

The areas in southeastern Hutchinson and southern Roberts counties found devoid of Sylvan, Hunton, and Mississippian strata also lack Morrowan rocks. These two areas are unconformably overlain by Atokan rocks which is indicative of post-Morrowan pre-Atokan erosion.

The thickest Morrowan section penetrated was 1,930 ft. in the Shell 1 Payne in Section 186, Block 42, of the H&TC Survey in Roberts County, Texas. The thinnest section penetrated was 10 ft. in the Johnson 1 Kisner, 21-24s-31w in Finney County, Kansas.

East Kentucky test finds sour gas

In Lawrence County 1 mile northwest of the recently discovered Zeal Hayes sour-crude field, Crest Oil Co. topped Corniferous lime at 1,865 ft. at 1 Cordle and was drilling ahead at 2,300 ft. No oil shows have been reported but operators have checked sour gas in the amount of 175 M.c.f.d. from a section in the Corniferous formation.

CALIFORNIA'S most southern oil pool is just north of San Diego County line.

In Orange County . . .

Oil moves toward San Diego

IN CALIFORNIA, Humble Oil & Refining Co. last week completed a wildcat which ranks as one of the most unusual discoveries in the state in several years.

For one, it easily holds the record for being the southernmost oil field in the state, being located in Orange County, less than ½ mile north of the San Diego County line.

For another, it is producing from a Cretaceous formation, the only such well in the Los Angeles region, and one of the few Cretaceous wells in the whole state. At the beginning of the year, there were only seven Cretaceous wells in California out of 36,283 producers. And of these seven, none were in the Los Angeles region.

The discovery, 1 Roy Wisbeek, et al. is located in SW NW 35-8s-7w, about 1 mile north of the coastal town of San Clemente and 6 miles south of famed San Juan Capistrano. The field has been named Cristianitos Creek.

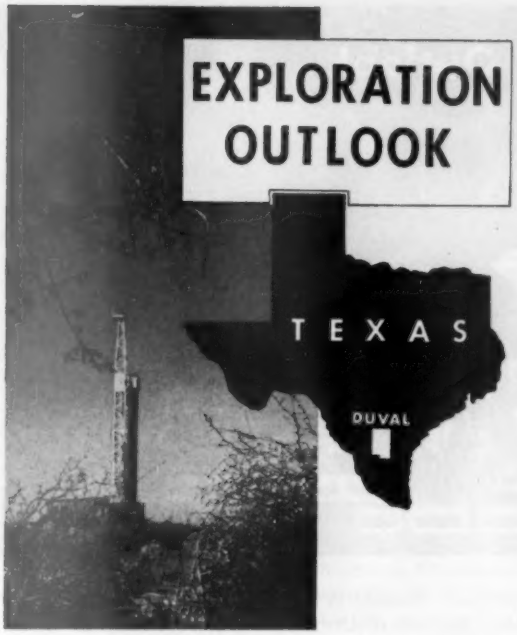
For the completion, the well was plugged back from 7,992 ft. to 5,934 ft. and perforated at 5,862-90 ft. Initially it was put on the pump making around 14 bbl. daily of 47°-gravity crude. Humble then moved back in, fractured the formation, and recompleted it flowing 63 bbl. daily of 54.4°-gravity crude through a 19/64-in. choke.

A second well is planned in the play within 90 days, Humble said. In addition to its holdings in the immediate discovery area, Humble also picked up a lot of acreage in the vicinity of the sub-commercial San Clemente field discovered by Texaco Inc., in 1954 about 1½ miles north of Humble's new find.

The San Clemente field was in SE NE 22-8s-7w. It produced a small amount of 45.8°-gravity crude before it was abandoned.

Drilling in this San Juan Capistrano-San Clemente region dates back as far as 1921 when Union Oil Co. drilled a 4,530 ft. dry hole in 30-7s-7w, some 8 miles north of Cristianitos field. In addition, operators have drilled other wildcats in the area every couple years since, but until Texaco's San Clemente field wildcat and the Humble discovery, nothing resembling commercial pay was found.

Before Humble's new producer, the southernmost commercial well in California was located in the West Newport Beach field, more than 20 miles to the north.



Texans look southwest

SOUTH and West Texas are battling it out for the lead in exploratory and development interest this fall. Duval County, scene of some of the earliest oil-hunting in South Texas, and extensively developed in waves of drilling through the years, continues its lead over the area with more than 25 active locations. West Texas' big smoke this year is in the Delaware basin, a vast, oil-secretive bowl of both successes and disappointments.

A new ripple of drilling

. . . spreads through Duval County. For several months it has been ahead of all South Texas counties in drilling activity. Despite the large number of fields already found and the widespread producing area embraced by them, oil, gas, and gas-condensate strikes are still popping up in a steadily increasing crescendo. So far this year there have been 118 successful field wells completed in Duval, while wildcatters have come up with 10 oil, gas, and gas-condensate discoveries.

Duval dates its productive history back to the year 1898 when shallow gas production was opened at Piedras Pintas at 160-200 ft. First oil production dates back to 1924 at Cole and Driscoll fields. Since those days more than 175 new fields have been tapped in the county.

Multiple-pay sands feature most of Duval's producing areas, running through a wide range of the geologic column from shallow Miocene sands to deeper Eocene-Wilcox pays. Producing depths range from 1,000-9,000 ft. Thus the county is particularly attractive for extensive and intensive exploration.

Typical of Duval's potential is a newly completed well in the East Peters area in the western part of the county. Texo Oil Corp. and Associates completed a Peters Gas Unit well for 205 M.M.c.f.d., open flow. This is one of the largest gas wells ever finaled in the area. Production is from a 40-ft. section of Yegua sand at 3,260-3,300 ft.

An elusive basin of mystery

. . . continues to command bold exploration in far West Texas. Three recent discoveries in Delaware basin will lend much to near-future drilling on the northwestern shelf and the southeastern edge.

Humble Oil & Refining Co. opened the westernmost production in the great Permian basin region at 1 Bandana Point Unit in Eddy County, southeastern New Mexico. This Pennsylvanian Morrow gas discovery flowed 1,800 M.c.f.d., opening a rare Morrow pay for the basin, and, for the entire region. This wildcat, 20 miles southwest of Carlsbad, although possessing a small potential, has created considerable interest in the nonproductive part of the northwestern shelf area.

New impetus in medium-depth and deeper drilling will be given to upcoming exploration in the southeastern portion of Delaware basin as a result of a Delaware sand discovery of note in Pecos County, and a highly promising Wolfcamp Permian strike 7 miles southwest.

Argo Oil Co. 1 Neal, 20 miles northwest of Fort Stockton, was completed for a daily potential of 542 bbl. from Delaware sand (Guadalupe Middle Permian) at 4,782-4,800 ft.

In the same area of Pecos County, Mobil Oil Co. 1 Kathleen J. Moore found pay prospects scattered through a 5,000-ft. section of Wolfcamp Lower Permian. This is the best-looking Wolfcamp discovery in this area so far. It should stir deeper drilling in the deeper part of the basin.

Texas drilling drops

. . . but there are some bright exploratory spots simmering. Explorers are dabbling around all the way through the upper Rio Grande embayment counties of Webb, Zapata, and northwestern Jim Hogg. Here the Wilcox Eocene rocks are the objective. The new Wilcox strikes are in the old Jackson Eocene producing areas. The most significant discovery here that has tremendous bearing on future Wilcox exploration is the recent 4-mile extension to Pescadito salt dome.

Look for increased wildcatting on the northeast extension of the deep Edwards trend in Karnes County. The first oil production on the "deep" Edwards trend was opened here recently, moving the play 20 miles northeast of previous production.

- Farther up the coast in Matagorda County-Palacios area, explorers have been clicking off discoveries in a steady succession in recent months. Palacios field is the focal point of this play which is expected to keep its steady pace in the coming months.
- The northwestern Andarko basin campaign is one of the most difficult in the nation to keep abreast of. This has been its busiest drilling period yet, and there are no indications of it halting or even slowing down. Pennsylvanian rocks remain the chief target, but Mississippian and Permian will rise in favor.

—John C. McCaslin.

Drilling levels, but fails to halt growing search for foreign oil

OVERSEAS DRILLING shows a slight drop this fall but there are still more rigs busy than at the end of last year. Cutbacks in Venezuelan drilling are the chief cause of this decline. On the bright side of the drilling ledger, however, is the increase in activity in Argentina, Colombia, Libya, northern and western Africa, and Iran. Discoveries in various parts of the international oil theater in the past few weeks plus newly announced drilling plans put sparkle in the overseas outlook.

Watch the Dark Continent

. . . for big wildcat stories. Africa is rapidly gaining in wildcat prestige with discoveries of great importance cropping up on the north and west sides of the continent.

Libya . . . Discoveries in this North African country have been bouncing back and forth from east to west. The latest strike is Oasis Oil Co.'s A1-26 Mississippian oiler on a 20,686-sq.-mile concession along the Libya-Algeria border, 250 miles southwest of Tripoli. This new oil find, the first on the concession, is more than 350 miles west of the block where Oasis already has established production. Libya's western border takes on new significance as a potential oil giant with Oasis' strike. This well could well be a middle anchor in the apparent trend of oil production that stretches 300 miles north-northeast from Shell's Bir Tlacsin to Atshan. Bir Tlacsin, still testing, reportedly is good for 1,000 bbl. daily. CPT(L's) French B-1 discovery is 60 miles southwest of Oasis' well. It is a 100-bbl. per day discovery. Esso has a strike of undecided potential at Atshan, 100 miles southwest of French B-1.

Algeria . . . The last big open block of desert acreage in eastern Algeria is on the market with U. S. firms bidding. Caltex and Pan Am are vying for this land which is halfway between Edjele and Hassi Messaoud. This section of the Sahara bears watching, for future exploration here will have considerable bearing on the Libya-Tunisia-Algeria oil potential.

El Agreb, 9 miles southwest of El Gassi 1 discovery, has been brought in as a producer to increase exploratory tension southwest of Hassi Messaoud. The El Agreb 1 is on the same crescent-shaped structure as El Gassi which flowed 2,540 bbl. per day earlier this year. Most think this find to be of major importance due to its similarities to Hassi Messaoud. SNPA, the discoverer, has two rigs busy in the area.

The prolific Edjele area in eastern Algeria picked up a 5-day discovery in September which adds more importance to this vast new oil province. CREPS Ouan Taredjeli 1, 8 miles northeast of Zarzaitine field, is on a northeast-southwest structure, cut off from Zarzaitine by a fault system.

Equatorial Africa . . . Both Nigeria and little Gabon are moving rapidly into the world's oil picture.

Shell-BP Development Co. opened a good oil pool at Ughelli, about 65 miles northwest of production at its sixth try west of the Niger River. A stepout try is already under way on the Nun River. Several other wildcats are planned in this promising virgin region. These wells will be watched closely by Nigerian operators because 20 years of exploration here netted only small fields for the most part.

In Gabon . . . This small West African nation could well become a major oil producer for the continent. A French-American group, Mobil and SPAEF, opened a remote oil field 45 miles inland from the coastal fields of Gabon. The new find is the Rembo Kotto 1, good for 340 bbl. per day at 2,000 ft. All of Gabon's 15,000-bbl. per day output comes from coastal fields. The new find should force a look into the country's interior possibilities.

Middle East interest

. . . centers in Iran where 10 rigs are busy. Offshore drilling captures the spotlight this year. Pan American International launched its exploratory program on the 6,000-sq.-mile concession, 80 miles offshore. If the well goes to its objective, it will be the deepest hole in the Middle East at 16,000 ft. This test is one of three

in the Persian Gulf. A Japanese-owned firm, Arabian Oil Co., has a well going southeast of Pan Am's well. The well blew out and caught fire last summer. Drilling will resume here soon. SIRIP, the Italian-Iranian company, has a wildcat set north of Pan Am's location.

Across the Pacific Ocean

. . . the Philippine Islands have first oil production while the Australians are still searching. First commercial oil for the Philippines is reported at a wildcat on Cebu Island, drilled by Republic Resources & Development Corp. The well made only 72 bbl. daily from two zones, but its discovery will lend some much-needed zest to a long period of disappointing exploration on the islands. Previous oil-hunting was centered on northern Luzon.

Australia . . . There are definite signs of a long-needed increase in drilling on this oil-barren continent. Drilling is under way in western Victoria, the Northern Territories, in the Perth basin of western Australia, and Papua. Wells are slated for Central Queensland, Victoria, the Thallon basin in southwestern Queensland, and the Eucla basin in Western Australia. Several other wildcats may go down throughout the country in the next year.

Look to Canada

. . . for exploratory excitement in the coming months. The big news here will be in the Arctic and Northwest Territories. This year's big oil and gas strike in the Yukon sired a tremendous look-see into the potential of this frozen wasteland, the remote Arctic islands and McKenzie River lowlands. Four years ago Red Earth Creek was considered north—10 years from now the Arctic Ocean will be the jumping-off point.

France and West Germany

. . . lead the drilling pace in Europe. France has 57 rigs busy, Germany 127. New Paris basin fields have upped French crude production to its highest point since the Parentis discovery. This new push in the Paris basin began last year at Coulommes, 25 miles east of Paris. Current output is 5,861 bbl. per day at this Petropar field. Chailly, a CEP discovery, makes 818 bbl. daily.

This field, 40 miles southeast of Paris, was tapped late last year. This year's finds are St. Martin-de-Bossenay, 65 miles southeast of the city. It made 786 bbl. per day for COPESEP. Chartrettes, 7 miles northeast of Chailly, is the smallest of these Paris basin fields. The RAP discovery made 314 bbl. daily.

Exploration still continues brisk in the basin and will increase before it declines. Another discovery is hinted at Mont Mirail 2, another RAP wildcat. Nobody expects these Paris finds to be anything like Parentis, but everybody expects there will be more fields opened in the basin.

—John C. McCaslin.

Northwest Oklahoma jumps ahead in success

Several important developments were reported in northwestern Oklahoma. Focal points of action were Woodward, Major, Dewey, Custer, and Ellis counties.

- The second well in Major County's West Campbell Hunton Siluro-Devonian field was completed. It is Sinclair Oil & Gas Co. 1 Case in C SE NW 4-22n-16w. Flow was 10,924 M.c.f.d. from perforations at 8,266-8,317 ft., 8,323-38 ft., and 8,353-63 ft. The condensate flow in 6 hours was 12 bbl. This is the third Hunton producer in the entire basin. Discovery well was 1 Spafford in NE SE SW 33-23n-16w. That well flowed 5,571 M.c.f.d. from perforations at 8,271-8,358 ft. and 53 bbl. condensate in 24 hours. Choke size was 25/64-in. This was the first Hunton production in the northwestern Anadarko basin, followed soon after by the now famous Custer County discovery at Mobil 1 Miller.
- At the first producing area in Custer County, North City pool, Mobil has the first offset success at 1 Carter in C SE NW 15-15n-16w. The well flowed 5 bbl. of oil per day and 5 M.M.c.f.d. from deep Hunton perforations at 14,690-14,776 and 14,792-14,880 ft. This is the fourth Hunton producer in the basin, and is the confirmation to the No. 1 Miller.
- Major County's two discoveries, one northwest of Ringwood and the other east of Ringwood, are Livingston Oil Co. 1 Keohn, C SW NE 19-22-11w. The well flowed 20 bbl. per hour on 18/64-in. choke from perforations at 6,750-6,804 ft. Location is 2 miles from West Forest Home field. The 1 Montgomery, C SE NW 6-21n-9w, between Ringwood and South Mena fields, flowed 2 M.M.c.f.d. from 6,808-40 ft. on ½-in. choke.
- Ellis County's Southwest Fort Supply pool got a third well at King-Stevenson Oil Co. 1 Thompson, NW NW NE SW 1-23n-23w. Flow was 3,300 M.c.f.d. on test at 7,902-13 ft. in upper Morrow Pennsylvanian, open 5 minutes. Shut in for half an hour, the well was reopened and flowed 9,800 M.c.f.d.

Palo Duro Strawn prospect is dry

UNTIL LATE last week, the southeastern lobe of big Palo Duro basin seemed assured of new Strawn (Pennsylvanian) production. Tennessee Gas Transmission Co.'s 1 A. L. Harp in Childress County, Texas Panhandle, had found gas and 200 ft. of oil-cut mud on drill-stem test but a later test produced a small amount of mud with no shows.

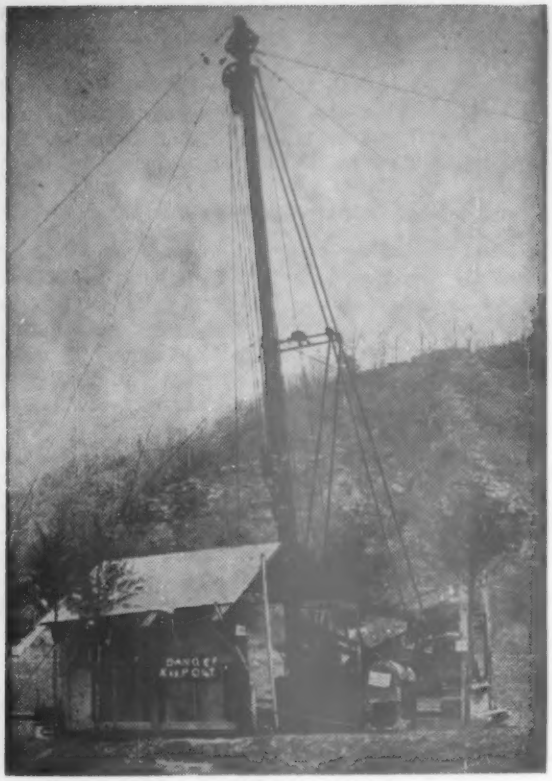
No. 1 Harp is 3 miles south of Kirkland in Section 417, Block H, W&NW Survey. It is ½ mile northeast of the old Alma Oil Co. 1 Lowe which was dry at 8,234 ft. but which had oil shows in a Pennsylvania reef.

Electric log tops in 1 Harp were: Canyon 4,833 ft. Canyon reef 5,310 ft., and Strawn reef 5,565 ft. The most successful drill-stem test was at 5,570-5,616 ft. which had gas in drill pipe and 200 ft. of oil-cut mud, with a trace of free oil. Bottom-hole flowing pressures ranged from 60-130 psi., with 60-minute shut-in pressure of 2,220 psi. A final test, however, at 5,678-5,701 ft., open 1 hour, recovered 5 ft. of mud with no shows.

The southeastern tip of Palo Duro basin has had scattered exploration, and a certain measure of successes. Nearest production to 1 Harp falls within a 25-mile arc drawn to the southeast. Hardeman County has had a few small one-well Strawn strikes, plus Shell Oil Co.'s Mississippian discovery of Conley field. The Shell well is the first major Mississippian opener in that portion of the basin, but has remained a one-well development.

BY PHILIP HARSHAM
Louisville Courier-Journal Staff Writer

Oil hunters move into coal empire



THIS WELL, at the junction of KY 30 and 315, west of Jackson, Ky., is typical of many small oil-well operations in eastern Kentucky.

OIL AND GAS operators, invading a territory traditionally claimed by coal, are moving with vigor into eastern Kentucky.

They now have more than 2,000,000 acres of land under lease in an area spreading eastward from the Cumberland Forest and reaching from the Tennessee border to the Ohio River. And lease buyers are still on the job.

Success in the operators' probing for oil and gas could end the region's long-standing dependence upon a coal-mining economy.

One company already has drilled 61 commercial gas wells this year. It expects to complete 14 to 19 more producers before 1959 runs out.

A Major Newcomer

Exploration is being carried on by some companies with deep-set roots in East Kentucky and by others that only recently scented a petroleum potential in the area.

A major newcomer is Hunt Oil Co. of Dallas. The firm has established Kentucky headquarters at Lexington and has begun widespread geological tests.

Hunt's leases at last count totaled something like 400,000 acres and dotted 19 counties.

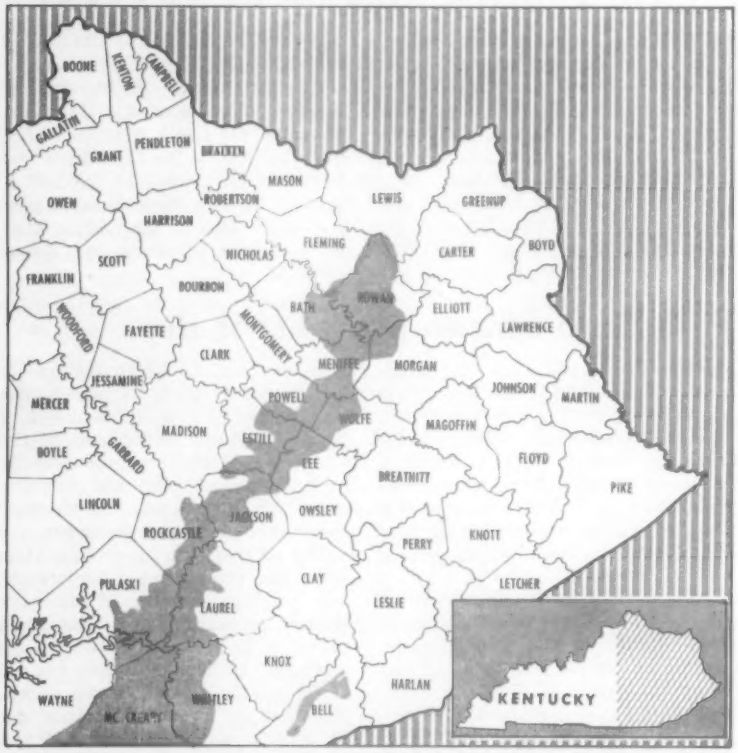
The firm's primary interest is in the eastern edge of the Cincinnati arch, a geological uplift that approximates the area of the Cumberland Forest and cuts a swath through Kentucky that stretches from McCreary County on the south to Lewis and Greenup counties on the north.

But like oil operators everywhere, Hunt is leery of oil-lease promoters who sometimes use unethical schemes to drive lease costs skyward.

"We're very disappointed by some of the promoters we're encountering and by the shortage of good operators in the area," said Robert Fox, manager-geologist for Hunt. "If it gets too bad, we may not be here tomorrow."

East Kentucky lease prices vary widely. Oil-industry sources place the range at 25 cents to $5 an acre, with

(From Louisville, Ky. Courier-Journal).



VIRTUALLY all of eastern Kentucky beyond the Cumberland National Forest (shaded) is engaging the interest of oil and gas operators. Some operations also are being undertaken in Bell County area.

$1 being the figure quoted most prevalently.

Oldtimers in the area include two major fuel-gas producers, Kentucky-West Virginia Gas Co., Ashland, a subsidiary of Equitable Gas Co., Pittsburgh, and United Fuel Gas Co., Charleston, W. Va., a subsidiary of the sprawling Columbia gas system.

Ashland Oil & Refining Co., Ashland, which already buys the lion's share of crude oil produced in Kentucky, is buying some leases for test purposes. "But we're not aggressive in this area," said Ray Althouse, the firm's exploration and production manager.

Secondary Recovery

Ashland, nevertheless, is getting secondary recovery from some old oil fields in East Kentucky, principally in Morgan and Elliott counties.

Other operations in the area include those of Columbian Fuel Corp., Pikeville; Petroleum Exploration, Lexington; Midland Corp., Lexington, and representatives of some of the country's largest, as well as some of the smallest, oil companies.

While oil fever is mounting in East Kentucky—primarily because of attention focused on the state by Green County's oil successes, oil exploration is not new to the area.

The 1920's saw extensive oil production from fields in Estill and Lee counties, where some companies today are reopening and acidizing old wells.

The eastern third of the state accounted for more than 3,500,000 bbl. of the near 18,000,000 bbl. of crude oil produced in Kentucky in 1958.

In the first 7 months of 1959, the area has yielded almost 2,100,000 bbl., with Magoffin, Lee, and Breathitt counties leading the field.

Robert A. Reilly, Owensboro, executive secretary of the Kentucky Oil & Gas Association, explained the growth in East Kentucky leasing this way:

"The nationwide publicity given the Green County oil strikes came at a time when there was a lull in the industry and centered attention on Kentucky. Many operators from other states moved in.

"But lease prices were run up very high on them, so they started looking around and moving on to other counties."

So far, East Kentucky has had no spectacular oil strikes, and companies engaged in exploration aren't talking much about their findings.

Geologists say guardedly, "The potential should be good," or, "Our companies wouldn't be spending money here if we didn't expect to find something."

W. W. Farrell, production manager for United Fuel Gas, said his firm has completed 61 producing gas wells this year. Eight to 12% of the drilling has resulted in dry holes, he said.

United Fuel, like Hunt Oil, is conducting geophysical and geological surveys over a wide area.

On Pine Mountain

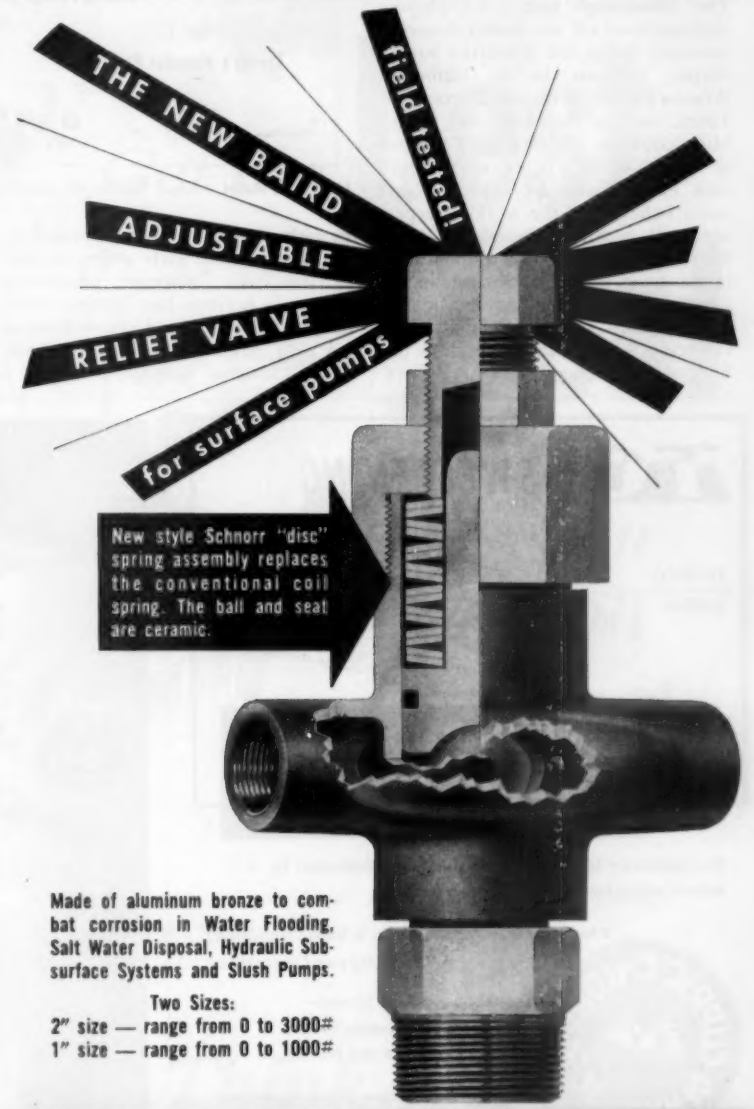
They have concentrated their exploration largely in Pike and Martin counties, but have conducted tests as well in Clay, Leslie, Breathitt, Bell, and other counties.

One unusual test by United Fuel is being drilled high up Pine Mountain, in Bell County, with a rotary rig capable of going beyond 12,000 ft.

Hunt offers $1.50 a foot for dry-hole drilling, provided that the test is drilled within a specified distance from Hunt leases and that the drilling is adequately logged.

New discovery at California's Fruitvale

The Fruitvale field—north area—yielded up a new fault-block discovery to Union Oil Co. of California in NE NE 29s-27e. The well, 41x-20 KCL, is located about ¼ mile west of the nearest producer in the area.


THE NEW BAIRD
ADJUSTABLE
RELIEF VALVE
for surface pumps
field tested!
New style Schnorr "disc" spring assembly replaces the conventional coil spring. The ball and seat are ceramic.

Made of aluminum bronze to combat corrosion in Water Flooding, Salt Water Disposal, Hydraulic Subsurface Systems and Slush Pumps.

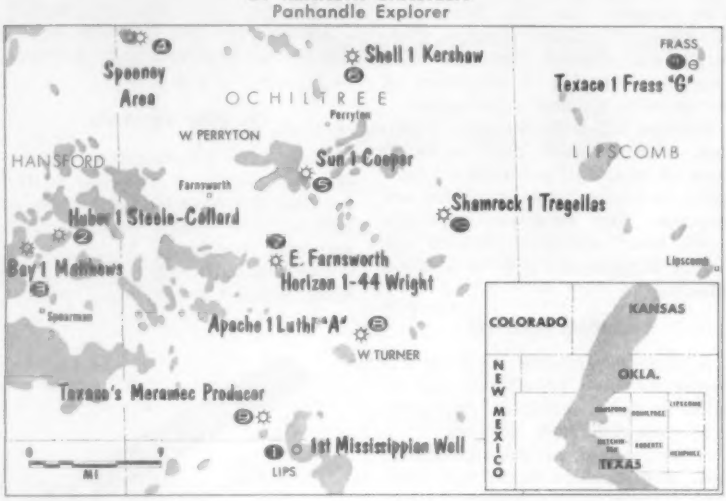
Two Sizes:
2" size — range from 0 to 3000#
1" size — range from 0 to 1000#

Baird MANUFACTURING COMPANY
P. O. BOX 380 TULSA, OKLAHOMA

Drillers dipping deeper into Mississippian

BY KENNETH CHASTEEN
Panhandle Explorer

SINCE the advent of exploration in the Texas Panhandle portion of the Anadarko basin, operators have used the Mississippian formation as a "cut-off section." "Cut a hundred into the Mississippian and log it" has been the last line on roughly 90% of all drillers' instructions. During 1959, however, events have occurred which, if followed up with the usual effectiveness of area operators, may prove the horizon as one of the principal producing sections in this part of the deep basin.

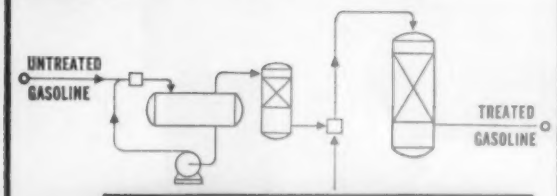


MISSISSIPPIAN rocks, father of pre-Permian success, return to Panhandle fold.

The Mississippi arm . . . Sloping southeastward off the buried Amarillo mountain range, the Anadarko basin's deepest portions lie in Hemphill, Wheeler, and Collingsworth counties, Texas, and in Beckham and Roger Mills counties, Oklahoma. Estimates of 30,000-60,000 ft. of sedimentary rock in the basin are common, and many believe that the world's deepest well will eventually be drilled here. Mississippian rocks are to be found in the basin in thicknesses ranging to 1,800 ft., but pinch out entirely against the Amarillo mountains, the Sierre Grande uplift, the Central Kansas uplift and other boundaries of the basin.

In early stages . . . Mississippian drilling is still in the early stages in most of the basin; however, production from the horizon has become fairly common in the huge Laverne-Mocane gas area of Harper and Beaver counties, Oklahoma. Southwest Kansas is beginning to approach the development stage from the Mississippian with such prolific fields as Pleasant Prairie and Eubank expanding their boundaries daily. Even in those part of the basin where the formation runs at depths of 4,500 to 8,000 ft., the basal

TC SWEETENING



TENNESSEE
COPPER CHLORIDE

Tennessee's Copper Chloride was developed to effect efficient Mercaptans removal.

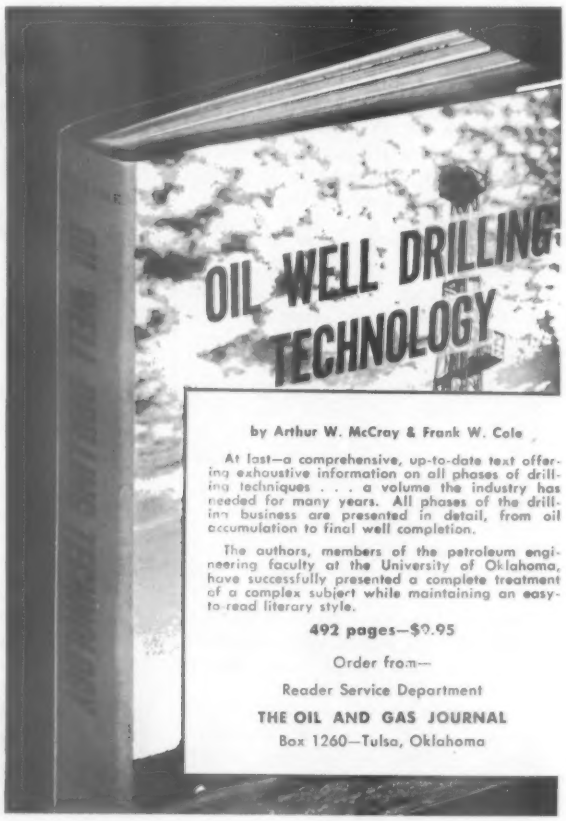
Place your confidence in a basic producer of Copper Chemicals.

CUPRIC CHLORIDE DI-HYDRATE

Other products of interest—
Ferric Sulfate—Copper Sulfate,
Copper Oxide—Sulfur Dioxide.

For samples make request on your company letterhead.

TENNESSEE TC CORPORATION



by Arthur W. McCray & Frank W. Cole

At last—a comprehensive, up-to-date text offering exhaustive information on all phases of drilling techniques . . . a volume the industry has needed for many years. All phases of the drilling business are presented in detail, from oil accumulation to final well completion.

The authors, members of the petroleum engineering faculty at the University of Oklahoma, have successfully presented a complete treatment of a complex subject while maintaining an easy-to-read literary style.

492 pages—$9.95

Order from—
Reader Service Department
THE OIL AND GAS JOURNAL
Box 1260—Tulsa, Oklahoma

Mississippian—in which studies indicate an erratic occurrence of sands—has yet to be explored to any extent.

Ten wells . . . In the Texas Panhandle, there is currently a total of 10 wells producing from the Mississippian. They represent eight separate fields. Only the Spooney area of Ochiltree County and the enormous multipay Hansford gas field in Hansford County can account for more than one producer from the horizon.

- Sinclair Oil & Gas Co. opened Mississippian production in the Texas Panhandle as early as 1949 with the 1 Lips in Section 185, Block 13 of the T&NO Survey in Roberts County (1 on map). The well produced 100-plus bbl. of oil per day, and ironically is the only well ever to produce oil from the formation in the Texas Panhandle. The well has since been reworked as a Morrow gas producer and has left only two counties of the Texas Panhandle officially productive from the horizon.
- In Hansford County, operators have been content to stop in the predominately productive Morrow formation. Hansford gas field contains the only Mississippian producers in the county with the J. M. Huber Corp. 1 Steele-Collard (2 on map) in Section 28, Block 2 of the WCRR Survey and the Josephine Bay 1 Mathews (3 on map), some two miles southwest in Section 3, Block 4-T of the T&NO Survey. Dually completed in the Morrow, the Huber well finaled for 800 M.c.f.d. of gas from the Mississippian while the Bay well, a single-zone completion, was a much better one at 9 M.M.c.f.d.
- Ochiltree County contained only three Mississippian producers before July 1959. Horizon Oil & Gas 1 Houghland was the only Mississippian producer in the Spooney area (4 on map), of extreme northwest Ochiltree County, Sun Oil Co. 1 Cooper (5 on map), in Section 18, Block 12 of the H&GN Survey opened the pay in West Perryton field, while Shell Oil Co. 1 Kershaw in Section 46, Block 10 of the HT&B Survey, discovered Mississippian gas at the rate of 10,200 M.c.f.d.

Turning point . . . July 1, 1959, may well have been the turning point for the Mississipipan in the Texas Panhandle. On that date, Horizon Oil & Gas Co., operating from Amarillo, completed the 1-44 Wright (7 on map) in Section 44, Block 13 of the T&NO Survey as a dual producer from the regular Morrow pay in East Farnsworth field of Ochiltree County, and as a Mississippian gas discovery. The Morrow was finaled for a calculated open flow of 13 M.M.c.f.d., and the Mississippian section was gaged for 9,900 M.c.f.d.

- In August of this year, Apache Oil Corp., Tulsa, finaled its 1 Luthi "A" (8 on map), as a 1½ mile northeast extension to Morrow gas production in the West Turner area of Ochiltree County, but only after perforations opposite the Mississippian at 9,374-94 ft., which flowed 1,500 M.c.f.d. after acid treatment, were encroached upon by salt water.
- Also during August, Crest Exploration Co. added a second Mississippian gas producer to the Spooney area of Ochiltree County with its 1 E. C. Greene (4 on map) in Section 7, Block Z of the W. T. Hungate Survey. Producing from openings at 7,394-7,403 ft., the well made a calculated open flow of 1,620 M.c.f.d. Operators have since dually completed the well for 1,950 M.c.f.d., from the Morrow.
- September was particularly significant for the Mississippian in the Texas Panhandle as Texaco Inc., completed the 3 C. S. McGarraugh "B," NCT-1 as the first Merimac producer (9 on map). Located in Section 139, Block 13 of the T&NO Survey, the new discovery lies only 5 miles northwest of the original Mississippian discovery

Get the best deal ...in Oil Banking!
One of the largest Oil-credit files in the nation
. . . and one of the oldest, most experienced Oil-banking
departments in the world . . . just —
Think...
1st
of Tulsa
SINCE 1895
FIRST NATIONAL BANK AND TRUST COMPANY
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

for the Panhandle. Producing from openings at 9,126-36 ft., the well had a calculated open flow of 23,500 M.c.f.d. of gas with a shut-in pressure of 2,664 lb. The well also opened a new Atoka producing area flowing 5,200 M.c.f.d. from perforations at 8,096-8,106 ft.

A driller misunderstood the "hundred-foot-and-log" order and drilled 200 ft. into the Mississippian at Shamrock Oil & Gas Corp.'s 1 W. T. Tregellas (10 on map) in Section 757, Block 43 of the H&TC Survey, Ochiltree County. The result was the opening of Mississippian pay to production for a calculated open flow of 4,430 M.c.f.d. plus 37 bbl. of condensate per day.

At present, the Shamrock 1 Tregellas is the most easterly Mississippian producer in the Texas Panhandle; however, testing is under way at a venture which has apparently proved the formation productive some 20 miles to the east in Lipscomb County.

In Section 105, Block 10 of the HT&B Survey, 15 miles north of Lipscomb, Texaco Inc., has the 1 Anna Frass "G" bottomed at 9,000 ft. with production casing cemented to total depth. Located inside Frass Tonkawa and Atoka oil field and slightly over a mile from the lone Morrow gas producer in the area, the venture has been opened at 8,848-59 ft., and acid-treated to flow as much as 4,200 M.c.f.d. of gas with 3 bbl. of condensate per hour through a choke. Operations are currently under way to dually complete in the Morrow, and perhaps even a triple completion in the Atoka may be attempted.

New era ahead . . . It would seem apparent that the Mississippian formation in the Texas Panhandle portion of the Anadarko basin can no longer be overlooked and used only as a logging point. The immediate future should see an increase in wells testing the formation. Development is overdue in the few areas which have already been opened to production from the horizon. It stands to reason that the next time a well goes 200 ft. into the Mississippian instead of 100 ft., it won't be a mistake.

California gets second Summerland dry hole

Offshore operations in California's coastal waters were marred by the second dry hole drilled by Standard Oil Co. of California on its 5,500-acre lease off Summerland. A tally on the lease now reads four producers, two abandonments. All the tests were drilled from the state's only offshore drilling platform. The latest abandonment was 5 Standard-Humble which was taken to 9,469 ft.

The day before 5 Standard-Humble was plugged, Standard completed 6 Standard-Humble as the lease's fourth producer. Drilling operations were underway on 7 and 8 Standard-Humble. These two wells were being drilled simultaneously using the same derrick.

North Tejon-Main area turns up big well

The North Tejon Field in Kern County continued its record of turning out big producers with the latest completion on the west edge of the Main area in the 2,000-bbl.-daily class.

Reserve Oil and Gas Co. moved into NE NW 19-11n-19w to drill 342-19 "W-T" to 11,722 ft. It was perforated at 10,772-11,133 ft. and 11,305-11,721 ft. for the completion. Initial production was 2,208 bbl. daily of 34.2°-gravity crude flowing through a 32/64-in. choke. It was choked back to 16/64-in. and was still making 762 bbl. daily.

The well is another link connecting up the Highway area and the Main area.

Activity in the area has fallen off somewhat from earlier peaks, but there were still five wells drilling and locations staked for three others. One of the new wells will be an easterly offset to this latest big producer.

Of the wells currently drilling, one was drilling below 11,936 ft. on a location on the extreme east flank of the Main area.

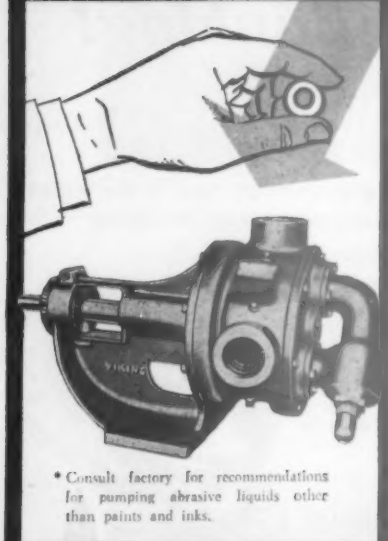
The locations staked include one almost 1 mile north of the field which will be drilled by Standard Oil Co. of California.

Permian pools become one field

THE KANSAS Geological Society's nomenclature committee merged nine new Council Grove Permian gas pools in three southwestern counties into one reservoir unit—the Panoma gas area. The new pool is tentatively described as taking in a 45-mile swath from north central Stevens County, through Grant and into southern Kearny County. It includes the former Hattie, Hattie Northeast, Panoma, Panoma North, Panoma Northeast, Panoma South, Panoma Southwest, Ulysses, and West Center fields. All produce from the Council Grove section below the upper Chase zone that provides the Hugoton gas area.

*A New Concept in Pumping *Abrasive Liquids!*

VIKING PUMPS WITH CERAMIC BEARINGS AND MECHANICAL SEALS



After years of experimenting and testing, Viking has developed this new pump that assures you double to triple life, while pumping paints, inks and other *abrasive liquids. Among its features are special ceramic bearings and mechanical seals. Designed for heavy duty, these pumps handle liquids from a minimum viscosity of 100 S.S.U. to heaviest viscous types.

G.P.M. SIZES 3 - 6 - 12 - 16 - 25 - 40

When writing for information, please give:

- Liquid to be pumped
- Viscosity of liquid (S.S.U.)
- Percentage and type of solids present in liquid
- Temperature of liquid
- Specific gravity
- Capacity of pump
- Suction lift or head
- Discharge pressure

And ask for bulletin SP-507T

VIKING PUMP CO.

Cedar Falls, Iowa, U.S.A.

In Canada, it's "ROTO-KING" Pumps

Offices and Distributors in Principal Cities

See Your Classified Telephone Directory

* Consult factory for recommendations for pumping abrasive liquids other than paints and inks.

Imperial looks to Nova Scotia

DRILLING OPERATIONS began today at Imperial Oil's first exploratory well in Cape Breton, Nova Scotia. The well, Imperial 1-Mabou, is approximately 5 miles south of the village of Mabou on the west side of the island.

The rotary drilling equipment being used for this well was originally moved to the Maritimes from western Canada by Imperial early in 1958 and has just completed a well at Port Elgin, N. B. This well was abandoned as a dry hole at 3,025 ft.

Imperial drilled two wells on the Nova Scotia mainland during the 1930's and has drilled nine wells in Prince Edward Island and New Brunswick during its current exploration program in the Maritime Provinces. This program commenced in 1956 when geological and geophysical surveys were initiated on Prince Edward Island and since then has been carried out in all three provinces. Drilling operations were commenced on Prince Edward Island early in 1958 and continued in New Brunswick during the first part of this year.

New pay seen for Michigan field

IN MICHIGAN . . . McClure Oil Co., 1 Tripp, NW SE SE 19-1n-13w, Trowbridge Township, Allegan County, cored Salina A-1 oil pay at 2,489-2,522 ft. to indicate new pay prospect in the 20-year-old 1,600-ft. Traverse field. Casing was cemented at 2,486 ft. and rotary moved off for completion unit.

Two commercial gas fields have been developed in Salina A-2 beds in Allegan County in the past 3 years, underlying old Traverse oil pools, and two other prospects currently are being developed besides the new Trowbridge test.

- Carter Oil Co., 1 Adler, NW SE SE 34-5n-15w, Ottawa County, in the old Fillmore oil field, tested 2 M.M.c.f.d. in A-2 and A-1 sections 2,612-58 and 2,774-97 ft.
- B. G. Hillard 1 Heil, SW SW NE 15-18n-1e, Gladwin County, ½-mile northeast extension test to Hay field, logged Dundee at 3,544 and had tight oil pay from 3,603-10 ft. Test is on a Carter Oil Co. farmout.

Ohio's Killbuck adds fifth well

IN OHIO, Preston Oil Co. announced its fifth producer on the Del Waltham tract, Section 6, in Killbuck pool, Killbuck Township, Holmes County, flowed 200 bbl. of oil per day with 319 M.c.f.d. after fracture.

The Clinton sand was logged at 3,204-21 ft. and had 8 bbl. oil and 40 M.c.f.d. natural.

Neppel Oil Co. stepout, 2 G. W. Snow, Section 21, in the same township, gaged 419 M.c.f.d. from the Clinton sand at 3,206-21 ft. after frac-

BEST FILES FOR REDUCED ELECTRIC WELL LOGS

E-28 for logs 5" or less in width. Model E-27 for logs 6⅜" or less. Either holds approximately 600 reduced logs, folded and filed on edge. Easy glide drawers on ball-bearing rollers. Steel drawer dividers support filed logs.

KRAFTBILT File Folders available in proper size for either model.

For CATALOG 59-B, write: Dept. J-559

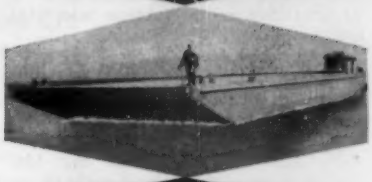
ROSS-MARTIN COMPANY
PO BOX 800 TULSA 1, OKLAHOMA

SECONDARY RECOVERY
Since 1922

PETROLEUM ENGINEERS
CABLE & STEPHENS
WICHITA FALLS, TEXAS

RESERVOIR ENGINEERING
Water Flooding Gas Repressuring
EVALUATION CORE ANALYSIS
SURVEYS ECONOMICS
Cost Estimates, Design, Installation
FIELD SUPERVISION
Phone 723-2167

STEEL BARGES for Charter



FOR OIL FIELD SERVICE

Mc Donough Marine Service
429 Balter Bldg.
New Orleans 12, La.
Phone: Magnolia 6824
Lafayette, La.
Phone: Ce. 4-1052

Northeast Petroleum Investment Company
811 Midland Savings Building
Denver 2, Colorado TAbor 5-8662

PRIVATE CAPITAL FOR INVESTMENT IN OIL, GAS AND RELATED PROPERTIES

We purchase producing oil or gas properties; royalties and oil payments. We will take interests in development programs, or purchase proven acreage, offsets or pipeline development.

FOR INFORMATION WRITE, WIRE OR CALL

J. P. Murphy, General Manager, Denver

ture with rock pressure of 1,025 psi.

• In New Guilford, Perry Township, Coshocton County, W. H. Bears completed the 4 Elmer Mayberry, Section 7, in the Clinton sand at 3,223-70 ft. Initial production in a 24-hour test after fracture was 100 bbl. of oil per day.

• Another test in Southwest Ohio by Kewanee Oil Co. in Clinton County is reported as a failure. Its 1 Newton Igo, MS-1458, Washington Township, was drilled through the Mt. Simon formation and abandoned at 3,351 ft.

Mississippian gas comes to Utah

UTAH'S second Mississippian producing area is evidently in the making at Pure Oil Co.'s 1 Northwest Lisbon wildcat in NE NW 10-30s-24e, San Juan County. This Paradox basin surprise flowed gas up to 17,300 M.c.f.d. during tests of the Mississippian at 7,643-7,701 ft.

Nearest Mississippian production is 40 miles northwest at Big Flat, the only other such field in the state. There have been some shows at Cane Creek, 10 miles southeast of Big Flat, but no production. The basin itself has only one other Mississippian producer—an Arizona wildcat earlier this summer opened oil production in that formation in Apache County.

First Almond oil in Desert Springs

IMPORTANT Almond Mesaverde Cretaceous oil production, the first in the general Desert Springs area of southwestern Wyoming's Green River basin, is being tested. Flow up to 256 bbl. daily was reported on ¼-in. choke at Texas National Petroleum Co. 1 Government-Withers in SW NE NE 32-20n-99w, Sweetwater County.

This Almond oil strike, a surprise in an area of big gassers from the same formation, is 3 miles south of West Desert Springs gas field, 7½ miles northwest of Arch Unit gas field. Both those fields have Mesaverde or Almond gas production. Location has already been proposed at an offset, the 1 Government-Chapin in SW SW 4-19n-99w. This will begin after completion of the oil strike. The Almond oil discovery is one of the most significant wildcat happenings in Wyoming this year, and lends much to the growing exploratory push in Green River basin.

Hunton confirmed in Anadarko pool

WESTERN OKLAHOMA'S highly important North Custer City field has been confirmed by Mobil Oil Co. The 1 Carter, a Hunton producer, flowed 6 M.M.c.f.d. from deep perforations in the Siluro-Devonian at 14,690-14,776 and 14,792-14,880 ft. Flow was on 12/64-in. choke.

This is the Anadarko basin's fourth Hunton producer — unknown until earlier this year when Mobil completed the 1 Miller to open first production in the county, the deepest production from Hunton anywhere, and the second Hunton producer in the basin. The opening of North Custer City is hailed as the year's most important find yet.

"Gravity-Magnetics" new bulletin out

A new three-color, eight-page bulletin describing the use of gravity and magnetics in petroleum exploration has been prepared by Geophysical Service, Inc., and is available to persons interested in exploration.

The bulletin, GM 59-1, is entitled, "Gravity-Magnetics . . . What They **Can** and **Can't** do for the Explorationist."

Specific examples of gravity-magnetics work and information on the key variables which must be considered in any gravity-magnetics program are discussed.

The bulletin can be obtained by writing: Marketing Department, Geophysical Service, Inc., Box 35084, Airlawn Station, Dallas 35.

Texas' Dawson has multipay prospect

Fusselman, Mississippian, and Spraberry production have been indicated at a Dawson County, West Texas wildcat. Two tests in the Fusselman, over a 150-ft. section, have been successful, one flowing oil and the other recovering oil from drill pipe.

The multipay prospect is Amerada Petroleum Corp. 1 R. C. Moore, southwest of Lamesa in central Dawson County. Location is Section 14, Block 36, T5N, T&P Survey. Oil or gas shows have been found in the following formations:

Spraberry . . . A drill-stem test at 7,790-8,030 ft. recovered 720 ft. of oil and gas-cut mud, plus 30 ft. of oil-cut mud below the circulating sub. No. 1 Moore is 1½ miles south of the 1-well Huddle - Manning Spraberry field.

Mississippian . . . Production was first indicated at 10,860-10,900 ft. where a drill-stem test recovered 75 ft. of 30° oil and 60 ft. of heavily oil-cut mud. Following a test at 11,275-11,448 ft., operators reversed out 12 bbl. of 37.5° oil. Flowing pressure on the latter test reached 1,405 psi. Thirty-minute shut-in pressure was 4,800 psi.

Fusselman . . . On a 6-hour drill-stem test at 11,555-11,705 ft. the well flowed 22 bbl. of 39.5° oil in 1 hour and 50 minutes, and reversed out 504 bbl. of oil from drill pipe. Flowing pressures were not reported.

A later test, also in the Fusselman, at 11,595-11,705 ft., had flowing oil in 4 hours and 10 minutes, with no gage or estimate made on the rate of flow. At last report another test was in progress to total depth at 11,755 ft.

Correction

The article "Geoacoustic Spectrum" by C. H. Thurber which ran in the October 12 issue of the JOURNAL (p. 228 ff) inadvertently was out of sequence. Here's how to make it read in order:

The last sentence on page 234 should read: "Bear in mind that the grain material and cementing material influence the formation velocity." From page 236 it continues in the third paragraph, left column, starting with: "Looking at the mixture line (Fig. 7) . . .". Continue to the paragraph immediately under the second equation, m i d d l e column, which should read: "The empirical plot of velocity, or time vs. porosity, is another good approach to the problem since there seems to be no definite relationship between porosity and velocity." Starting on page 235, left column, with: "As an aid to the engineer . . .", please read to the original wrong insertion of page 236, jump it as noted, and the order is then correct to the end.

The figure number references on page 236, when given as Fig. 11 or Fig. 12 should be interchanged.

Our apologies are in order to both Mr. Thurber and to our readers. Simply, we goofed!

Any reader desiring corrected reprints of this paper is requested to write to The Oil and Gas Journal, Exploration Dept., Box 1260, Tulsa. These are complimentary, of course.

First Cotton Valley pay on Mexia-Talco zone

Another Jurassic field, and the first Cotton Valley production along the Mexia-Talco fault zone is in prospect for East Texas.

R. J. Caraway and Pan American Petroleum Corp. 1 W. A. McCoy is 1 mile southeast of Fruitvale in northern Van Zandt County. It is a 13,000-ft. Smackover test, and was drilled ahead after making the Cotton Valley gas shows.

The wildcat indicated gas production in the Cotton Valley after hitting a 15-ft. drilling break. Interval tested was at 10,528-51 ft., using ¼-in. bottom and ½-in. top chokes, with 2,000 ft. of water cushion. Gas surfaced in 10 minutes and the water cushion in 19 minutes, under maximum surface pressure of 1,100 psi. Recovery included 225 ft. of gas-cut mud. Bottom-hole flowing pressure was 3,544-3,983 psi.

Earlier, the well reported oil and gas prospects in the Rodessa at 8,379-8,303 ft. At that interval, gas surfaced in 12 minutes and recovery was 1,875 ft. of oil.

No. 1 McCoy is on a 100-acre tract in the James Cheshire Survey, A-181. The nearest Cotton Valley production is over 100 miles to the east in counties along the Texas-Louisiana border. It is 5 miles northeast of Fruitvale field which was completed as a Smackover gas discovery last year by Caraway and Three States Natural Gas Co.

Operators of 1 McCoy hold 3,500 acres around the well. Companies supporting the venture include Shell Oil Co. and Atlantic Refining Co.

Second well added to Texas Coast pool

The second well in the new Southwest Pheasant field, in southwestern Matagorda County, Texas Gulf Coast, has been completed in two new pay zones, both deeper than either of the discovery well's productive sands.

Magnolia Petroleum Co. opened the field last August. Its discovery well, 1 Trull, is dually completed in sands at 8,155-63 ft. and 9,098-111 ft., both productive of gas and condensate. The second well, 1 John Matl, 3,000 ft. southwest, is dually completed at 10,559-95 ft. and 10,772-82 ft.

Flow from the upper zone tested 3,260 M.c.f. daily through ⅛-in. choke under pressure of 5,832 ft. with gas-liquid ratio of 18.7 M.c.f. per bbl. The lower zone flowed 2,840 M.c.f. through ⅛-in. choke under pressure of 5,375 psi. with gas-liquid ratio of 22.6 M.c.f. per bbl. Gravity of the liquid in both cases is 50°.

The new area is 5 miles northwest of Palacious, focal point of one of the Texas Gulf Coast's most active exploration and development programs this year.

Old Refugio field sees new action

New drilling off the west side of the old Refugio field in Texas' central coastal region has given Atlantic Refining Co. two good oil wells.

Atlantic's lease, acquired from Houston Oil Co. several years ago, is in a sector of the field which has been productive since 1937. The new drilling is the first since 1951.

Latest well, 66 P. H. Rooke, is dually completed in sands at 6,166-73 ft. and 6,055-61 ft. It flowed 162 bbl. of 38°-gravity oil, with 28% water, per day through 12/64-in. choke from the lower zone, and 154 bbl. of 39°-gravity oil, plus 7% water, per day through 14/64-in. choke from the upper pay.

The first well, 65 Rooke, also is dually completed with pays at 4,500 ft. and 6,100 ft.

More Arkansas gas

Another discovery is being added to the long succession of new gas-productive areas opened in the Northwest Arkansas basin this year.

Discovery is by Gulf Oil Corp. at its 1 Bauman, in 13-9n-22w. Testing a 7-ft. perforated interval at 4,131-38 ft. in Atoka sand, the well flowed 1,538 M.c.f. in 12 hours. It appears to be one of the best discovery wells completed in the basin so far this year. Total depth is 4,744 ft.

Location is 8 miles southeast of Clarksville, and 10 miles northwest of Russellville. It is 3 miles north of Knoxville field and about the same distance west of Tates Island field.

In the meantime, a 1959 gas-discovery in Franklin County, 30 miles northwest of the new Gulf well, has been confirmed. This is the new Barnes field, opened last August by Arkansas Western Gas Co. The area's second well, drilled by Stephens, Inc., is completed in two Atoka zones, one in open hole at 2,012-13 ft., and the other with casing perforated at 17,000-22 ft.

Stephens' well 1 Harris Estate, in 17-11n-26w, is 1½ mile north of Arkansas Western's discovery well, 2 Patrick Estate. Open-flow potential is rated at 4,500 M.c.f.d. from the lower zone, and 3,250 M.c.f.d. from the upper interval. Discovery well also is dually completed in the same zones.

Discovery wells

CALIFORNIA

Orange County: Humble Oil & Refining Co. 1 Roy Visbeek, SW SW 35-8s-7w, 63 BOPD, 54.4° gravity, 0.1% cut, 19/64-in. choke, perfs. 5,862-5,890 ft., TD. 7,992 ft. (New field discovery in Cristianitos Creek region. This ranks as southernmost oil discovery in California.)

LOUISIANA GULF COAST

Calcasieu Parish: Charles H. Lawrence, Jr., 1 E. O. Doughenbough, 29-10s-7w. IP 1,030 M.c.f.d., 12/64-in., TP 1,475 psi., perf 3,452-56 ft. New pay in South Manchester field.

Plaquemines Parish: Shell Oil Co. 1 Shell-Orleans Levee Board, 14-19s-16e. IP 162 BOPD, 140 M.c.f.d., 9/64-in. 31°, GOR 784 cu. ft. per bbl., TP 1,280 psi., perf. 10,590-633 ft., and 260 BOPD, 111 M.c.f.d., 8/64-in., 32°, GOR 427 cu. ft. per bbl., TP 1,450 psi., perf. 9,036-42 ft. TD 12,736 ft. New-field discovery—Empire.

Shell Oil Co. 1 Shell-Cazezu, 52-20s 29e. IP 213 BOPD, 148 M.c.f.d., 8/64-in., 31.2°, GOR 694 cu. ft. per bbl., TP 1,200 psi., perf. 9,486-95 ft. TD 11,450 ft. New-field discovery.

St. Martin Parish: Pan Tech. Exploration Co. 1 S. C. Burdin-Voorhies Estate et al, 3-10s-8e. IP 2,993 M.c.f.d., 72 BCPD, 10/64-in., 55.2°, TP 7,750 psi., perf. 13,886-934 ft. TD 14,200 ft. Discovery well Crocodile Bayou field.

LOUISIANA OFFSHORE

South Marsh Island Area: Texaco Inc., 2 State Lease 340-Mound Point. IP 196 BOPD, 5,429 M.c.f.d., 13/64-in., 48.2°, TP 4,200 psi., perf. 12,629-34 ft. TD 12,794 ft. New pay in Mound Point field.

MICHIGAN

Manistee County: Welch & Lucas 1 Adamczak, SE SE NW 24-21n-17w, Filer Township. IPF 612 M.c.f.d. Elev. 619, A-2 3,562, A-1 3,850, pay 4,121-65; 3,862-3,932. TD 4,165 ft. New gas field.

SOUTHEAST NEW MEXICO

Eddy County: Humble Oil & Refining Co. 1 Bandana Point Unit, 13-23s-23e, 13 miles north of White City. IP calculated open flow 1,800 M.c.f. of gas, Morrow 9,782-86 ft. TD 12,262 ft., elevation 4,026 ft. Morrow 9,582 ft., Devonian 10,932 ft., Ellenburger 12,050 ft.

WEST CENTRAL TEXAS

Fisher County: Dorfman Production Co. and Delta Drilling Co. 1 O. R. Burnham, Sec. 69, Blk. 1, HT&B Sur., 11 miles southwest of Hamlin. IPP 40 BOPD, 42°, GOR 193:1, Canyon sand 4,624-35 ft. TD 5,850 ft.

Palo Pinto County: Mid-Tex Oil Co. 2-B Belding, Sec. 5, Blk. 2, T&P Sur., 8 miles north of Brad. IPP 2 BOPD, 38°, Strawn 2,770-2,869 ft. TD 2,990 ft.

Parker County: Kingwood Oil Co. 1 Doss, Sec. 2550, TE&L Sur., A-1310, 2½ miles west of Whitt. IP 81,500 cu. ft. of gas, pay 1,810 ft. TD 2,365 ft.

Toto Gas Co. 1 Franklin, Sec. 207, T&P Sur., 1½ miles southwest of Poolville. IP 1 M.M.c.f. of gas, Caddo 3,743 ft. TD 3,750 ft.

Taylor County: Mark Oil Co. 1 R. M. Wagstaff, H. J. Kleburg Sur. 114, 1 mile southwest of Buffalo Gap. IPP 39 BOPD, 40°, Flippen sand 2,278-85 ft. TD 2,319 ft.

Heyser Pushes Selling Job

. . . for the oil industry. Texas Mid-Continent president says poor public relations one of oil's biggest problems.

IN ESTILL S. HEYSER, JR., the Texas Mid-Continent Oil and Gas Association has a new president who is acutely aware of petroleum's poor public relations and one who is determined to do something, if he can, to better them.

Heyser, 45-year-old Dallas independent, feels it would certainly be an eye-opener, and probably beneficial, if many more oil men were to do a bit of visiting in the North and East.

He has had his own eyes opened to the low opinion of the industry held by most people in these areas. In recent years, Heyser has spent several vacations in northern Michigan. He had occasion to talk at length there with many businessmen from the Detroit and Chicago areas.

"These people are convinced that, in our depletion allowance, the oil industry has a bird's nest on the ground. And the alarming thing is that these people are not extreme liberals or socialists. They are conservative people who conventionally take conservative stands on most issues. They are badly misinformed. But they don't know that. And they'll be hard to convince."

Heyser feels that such people must be educated or it will be only a relatively short time until the industry finds its depletion allowance severely trimmed.

New office pushed . . . The Dallas independent was at work on the industry's public-relations problem long before he was named Texas Mid-Continent president.

He has served during the past 2 years as vice president of the general Mid-Continent Oil and Gas Association. In that post, he was one of the chief planners in the association's recently announced reorganization to provide more effective representation for the industry in Washington.

"When a senator friendly to the oil industry needs information on the industry, he usually needs it in a hurry. Heretofore, we haven't been able to provide information on short notice. Now we'll be able to do that. Generally, we hope our Washington office will help in presenting the oil picture in a much more realistic light."

New gas hope? . . . One Heyser hope is that information supplied by the new office will aid in freeing the captive gas-producing industry.

He attaches considerable significance to and draws new hope from a speech made by Fred Seaton, Secretary of the Interior, before the American Gas Association recently. Seaton said he would like to see the industry take the lead in seeking relieving legislation which would enable the Federal Power Commission and the industry to work together. The Secretary declared that the industry was not to blame for the complete confusion which has developed from FPC's effort to regulate it.

Paying off a debt . . . Heyser feels every oil man owes something to his industry and should serve it where he can, even if it proves a bit burdensome at times. He is paying off his debt with interest.

Along with his service in the Mid-Continent and Texas Mid-Continent groups, he is a member of the board of councillors, Central Committee of Production, American Petroleum Institute, and a director of the Independent Petroleum Association of America.

He has been associated for 21 years with the oil-producing firm of Heyser & Heard, Dallas, founded by his father who died in 1938 and Claude E. Heard, Beeville, Tex. He is now a partner in that firm.

▶▶▶ Personals

Gordon Lewis, superintendent of the methanol division at Du Pont's Sabine River works, Orange, Tex., has been named assistant mechanical superintendent at the plant. He succeeds **Keith Dahl,** who has been transferred to Parkersburg, W. Va. **Tom Braun,** ethylene division, will succeed Lewis.

Paul H. Jones, project engineer in the New York engineering department of Texaco Inc., has been transferred to Houston as project engineer in the producing department, gas division.

Mel Tongish of Creole Petroleum Corp. is leaving Venezuela to become Bengasi district manager for Esso Standard (Libya). Others shifting from Creole to Libya are **James Curry,** who will be district geologist, and **George McCammon,** who is on loan to head up an engineering staff.

John P. Steeper, administrative assistant in the production division of Cities Service Oil Co., has been named administrative assistant to the president. **Robert E. Anderson,** supervisor in the analytical engineering section, production division, will succeed Steeper.

The company, as are many other independents in Texas, is feeling the strain of a prolonged period of low allowables in that state. Roughly 90% of the company's production is in Texas. From a normal average of 20 to 25 wildcats a year, the company has been forced to cut back now to only about 7 or 8.

Heyser feels the industry in Texas is going to have to tighten its belt and struggle through several more lean years before things get substantially better. It is a matter, he thinks, of oil markets catching up to supply.

No wild goose chases . . . It was probably difficult for some of Heyser's Michigan acquaintances to believe that he is an oil man. He doesn't fit their picture.

He is amiable but soft-spoken and unobtrusive. He answers questions quickly and fluently, but leaves the impression that his answers have been thoroughly thought over before he gives them. He obviously looks well before he leaps.

Heyser is one of few active independents with a legal background. He was graduated from Southern Methodist University law school in 1938, after earlier attending Harvard University, the University of Texas, and Phillips Exeter Academy in New Hampshire. He was class president at SMU.

He practiced law in Dallas with the firm of Worsham & Worsham for about a year after graduating before joining Heyser & Heard. His oil career was interrupted for 3½ years when he joined the Navy during World War II, emerging as a lieutenant commander in 1945.

Heyser is an avid outdoorsman. Though small, he played football in high school at Highland Park in Dallas and at Harvard.

Quail hunting is a first love. And once a year Heyser and a small group of friends gather in California or Arizona to go after the elusive white-wing dove.

Paul E. Robinson, production engineer for Sunray Mid-Continent Oil Co., has been named staff production engineer in Corpus Christi, Tex. **Baptiste B. Shunatona, Jr.,** junior production engineer, has been named production engineer, Oklahoma City. **Donald H. Staires,** junior engineer, has moved up to engineer, Oklahoma City. **Dana L. Smith,** junior engineer, has been named engineer in Shreveport, La.

Zuhayr A. Moghrabi, formerly chemical engineer at Mobil Oil Co.'s Beaumont, Tex., refinery, has been transferred to Mobil Oil Co. in New York in the same capacity.

J. R. MacGregor has been named a vice president and director of California Research Corp. in charge of petroleum products research. He succeeds **J. L. Cooley,** who recently retired. MacGregor has been with Socal since 1925.

Joseph A. Kornfeld, Tulsa consultant, has formed Kornfeld International, with headquarters in Tulsa. The new firm will specialize in geological, geophysical, economic, and engineering services on foreign oil concessions. Kornfeld will be manager.

F. M. Files, formerly on loan to Phillips Petroleum Co.'s international department as technical adviser to the manager, has been promoted to coordinator of manufacturing, international department. He will headquarter in Bartlesville, Okla.

T. B. Smith has been named superintendent of manufacturing for the Canadian division of Phillips Petroleum Co.'s international department. He will headquarter in Fort St. John, B. C. Smith was formerly superintendent of the McMahon plant at Fort St. John, which is jointly owned by Phillips and Pacific Petroleums, Ltd. **H. N. Olson,** assistant superintendent, will succeed Smith as superintendent of the plant.

Charles B. Duke, manager of Sun Oil Co.'s refinery supply and distribution division, has been named manager of a new crude-oil purchase and sales division in Philadelphia. The new division will handle both domestic and foreign crude-oil purchases and sales. It will be a part of the production department under **Jno. G. Pew,** production vice president. **D. E. Norris,** crude-oil salesman, and **Robert E. Lee,** manager of crude-oil supply and transportation, have also been transferred to the new division. Norris will be responsible for foreign sales and purchases, and Lee, at Beaumont, Tex., will be in charge of domestic activities. Duke will be succeeded in the refinery supply and distribution division by **John L. Olsen,** formerly assistant director, technical economics, in the research and engineering department. **Richard Fleming,** assistant director in technical economics will succeed Olsen.

▶▶▶ Personals

G. D. (Dan) Almen, Jr., vice president and manager of the Midland, Tex., division of Sinclair Oil & Gas Co., has been transferred to Sinclair Oil Corp. in New York, where he will help direct world-wide exploration and production activities. Almen will assist **Fred A. Bush,** vice president and a director of Sinclair Oil & Gas and a vice president of the parent company. **Robert L. Elston,** assistant manager of the Midland division, has

ALMEN

ELSTON

been elected vice president and division manager, succeeding Almen. Almen had been manager of offshore operations and Houston division manager for Sinclair Oil & Gas before moving to Midland as manager in 1958. He was elected a vice president in 1956. Elston is a former Tulsa division exploration superintendent and had been assistant manager in Midland since 1957.

John P. Lunde, formerly chief engineer of Arabian American Oil Co., has been appointed assistant general manager of engineering and construction.

J. P. (Jack) Powell, formerly with the U. S. Bureau of Mines, has joined Treat-Rite Water Laboratories, Inc., Nowata, Okla., as head of the engineering department. Powell joined the Bureau of Mines in 1947 in Bartlesville, Okla.

Ray C. Adam, manager of Mobil Oil Co.'s Dallas division economics department, has been transferred to New York with Socony Mobil Oil Co., Inc., as manager of the planning and analysis department (Mobil Oil). He will be responsible for planning activities primarily concerning Mobil Oil operations. In reorganization of Socony's corporate planning staff, **William P. Tavoulareas** has been named manager of the planning and analysis department (Mobil International), and **Thomas W. Phelps** has been named manager of the economics and special studies department.

Personals

R. D. White, chief geologist for Plymouth Oil Co. since 1955, has joined Southern Minerals Corp., Corpus Christi, Tex., as chief geologist. A graduate of the University of Chicago, White was assistant chief geologist in New Orleans with The California Co. before Joining Plymouth.

H. L. Caldwell, chief engineer of Keener Oil Co., Tulsa, has been promoted to general superintendent of production. He succeeds **John J. Lawry,** who has retired. Lawry joined Keener in 1940 as general superintendent. Also, **T. J. Rhoads,** chief accountant, has been named office manager. He succeeds **C. H. McKnight,** who has retired after 40 years with the company.

R. S. Agatston, district geologist in Durango, Colo., for Atlantic Refining Co., has been named supervisor of a new research and special services group. Supervisors in the new group will be **Kenneth M. Renfro,** photogeologic supervisor; **George Norton,** surface geologic supervisor; **Anthony V. Messineo,** electric logging; and **Henry J. Morgan, Jr.,** stratigraphic. Morgan will retire in January and will be succeeded by **Paul W. Foster.**

Harry W. Barbee, Jr., seismologist in Tulsa for Sunray Mid-Continent Oil Co., has been named Los Angeles division geophysicist. **Robert T. McCauley,** Lafayette, La., district seismologist, has been transferred to Houston as district geophysicist.

Dr. Bernard N. Rolfe, formerly consultant on water-flood recovery, has joined Sinclair Research Laboratories, Inc., as assistant director of the exploration research division. Rolfe was with United States Geological Survey and Cities Service Research & Development Co. before becoming a consultant.

R. B. (Bob) Hastie, administrative assistant in Atlantic Pipe Line Co.'s southwestern division headquarters in Dallas, has been appointed assistant regional superintendent of the West Texas-New Mexico region. He succeeds **R. G. Dulaney,** who was recently named regional superintendent.

MACAULAY

A. Boone Macaulay, formerly manager of Atlantic Refining Co.'s Oklahoma - Kansas region, has been appointed manager of the Rocky Mountain region. He succeeds **R. T. (Bob) Cox,** who will become manager of the West Texas-New Mexico region in May after retirement of **Niles B. Winter.** Atlantic's Oklahoma-Kansas and Dallas-eastern areas were recently combined to form a new Mid-Continent region, so a successor to Macaulay will not be named (OGJ, Oct. 26, p. 149).

Donald J. Buckley, section head in Esso Research & Engineering Co.'s chemicals research division, has been appointed a senior research associate, chemicals research. **Dr. Wladimir Philippoff,** formerly with Franklin Institute laboratories, has joined Esso Research as research associate in the products research division.

David F. Edwards, manager of Esso Standard Oil Co.'s Bayonne, N.J., refinery, soon will become employe-relations manager for the new Delaware - incorporated Humble Oil & Refining Co. The new company, which will combine five Standard Oil Co. (N.J.) affiliates into a single firm, will have approximately 43,000 employes. Edwards' appointment will become effective when shareholders approve the proposed merger. Edwards joined the Jersey companies in 1926. He has been manager of the Bayonne refinery since 1957.

Willard C. Gere, United States Geological Survey, has been elected president of Intermountain Association of Petroleum Geologists, Salt Lake City. Other officers will be **John F. Harvey,** Sun Oil Co., first vice president; **D. F. Mecham,** Ohio Oil Co., second vice president; **Alan C. Dille,** Gulf Oil Corp., secretary; and **Ronald C. Bartley,** Shell Oil Co., treasurer.

Charles T. Klein, Cities Service Oil Co., Bartlesville, Okla., has been elected a director of Independent Natural Gas Association of America. He succeeds **Gentry Lee,** also of Cities Service. All other officers and directors of the association were re-elected.

Claude Wild, Jr., counsel in the Washington office of Mid-Continent Oil and Gas Association since 1949, has been named Gulf Oil Corp. legislative representative in Washington. The appointment was effective November 1.

Deaths

J. Patrick D'Artois, 51, resident manager of Ohio Oil Co. of Guatemala, died October 23 in Guatemala City of complications following a heart attack. D'Artois joined Ohio Oil in 1936 as an attorney in Shreveport, La. He was named Ohio's representative with Conorada Petroleum Corp. in Guatemala in 1955 and became resident manager of Ohio of Gautemala in 1956.

F. Tom Parks, 69, retired vice president and director of Public Service Co. of Colorado and former director of Colorado Interstate Gas Co., died October 22 after a brief illness.

Charles Horace Rutherford, 77, retired field superintendent for Sinclair Oil & Gas Co., died October 22 in a Tulsa hospital after a long illness. Rutherford joined Sinclair in Tulsa in 1918. He was superintendent in Wyoming fields and in Seminole, Okla. before retiring in 1948.

V. N. (Verne) Sheldon, 51, assistant secretary-treasurer of W. C. McBride, Inc., St. Louis, died October 17.

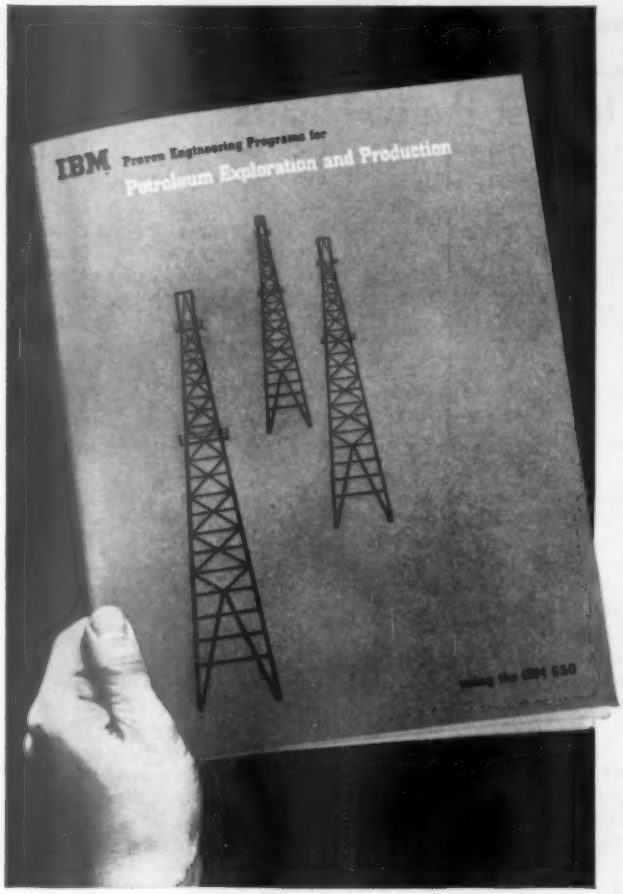
James A. Cashen, Jr., 61, retired manager of wholesale sales for American Oil Co., died October 20 in Hudson, N.Y. Cashen was with Amoco 37 years before retiring in 1956.

L. R. (Roy) Baker, 78, once operator of a small refinery in Burkburnett, Tex., and active in Oklahoma leasing, died October 25 in Duncan, Okla. Baker was owner of the land where Oklahoma's Velma field was discovered.

Roy Ellis Callahan, 63, traffic manager for Sinclair Oil & Gas Co., died October 28 in a Tulsa hospital. Callahan joined Sinclair in 1923. He had been traffic manager since 1948.

IBM EXPANDS ITS SERVICE TO THE PETROLEUM INDUSTRY—

21 Proven IBM 650 Programs for Exploration and Production



IBM offers for your use a package of 21 IBM 650 computer programs for Exploration and Production. These 21 programs make available to IBM 650 users years of valuable customer experience in electronic computing.

The programs have been carefully selected from many petroleum computer applications for their wide interest to engineers and geophysicists engaged in exploration and production. They are now available without cost, packaged and ready for your immediate use. The programs cover a wide range—from geophysical to research and productivity applications.

Typical programs from the geophysical series—

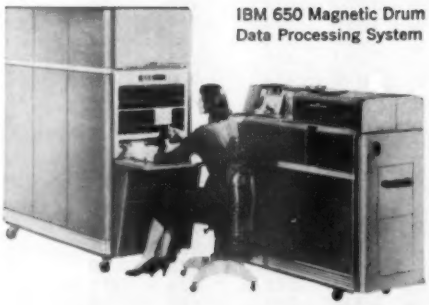
- Determination of a Linear Velocity Function
- Ray Trajectory Migration
- Simulated Seismogram from a Continuous Interval Velocity (CVL)
- Normal Move-Out Time (Δt) Chart
- Refraction Time-Distance Curve Computation
- Time Domain Filter
- Geological, Geophysical Mapping Routine
- Porosity from the Gamma Ray Log
- Residuals and Derivatives of Gravity

Send for new booklet describing all 21 programs in detail. Included is information on how these programs can be used in your own operations. Just fill out the coupon below.

The IBM Refinery Engineering Package offered last year is still available. If you missed any or all of the complete series of 14 programs, check the appropriate box on the coupon for full information.

BALANCED DATA PROCESSING

IBM



IBM 650 Magnetic Drum Data Processing System

Dept. 703
International Business Machines Corporation
112 E. Post Road, White Plains, N. Y.

☐ Please send me the free booklet, "IBM Proven Engineering Programs for Petroleum Exploration and Production."

☐ Please send information on the IBM Refinery Engineering Package of 14 programs.

Name_____

Position_____

Company_____

Address_____

City_____ Zone_____ State_____

Winter residual demand could put imports program to a test

BY JOHN HYDEN

A NORMAL winter increase in residual demand may call for a few changes in the present supply situation.

Residual stocks total about 60 million barrels compared to 68 million barrels at this time last year. Stocks on the West Coast account for 45% of the present figure, leaving stocks east of the Rockies with little working room.

Distillate stocks have soared to about 180 million barrels, so there is not much pressure for increased production. What production there is will not give much of a boost to residual, with yields constantly decreasing as shown in the table.

There does not seem to be any price activity in the residual market that would prompt refiners to increase the yield, so it looks as if imports get the nod for any relief needed.

The fourth quarter of this year probably does not face much of a problem. The present level of production, plus stocks and the 365,000-bbl. daily import quota should be able to provide for demand unless extreme winter weather should alter the situation.

But the first-quarter demand next year may not be so easily handled. The table shows a comparison of first and fourth-quarter figures for the last 6 years and estimates for the fourth quarter this year and first quarter next year. The resulting per cent changes show that supply will have to get a push from somewhere to be able to satisfy the expected demand.

Past figures show that first-quarter refinery production east of the Rockies has been decreasing and that imports have been increasing slightly until imports exceeded refinery production for the first quarter of this year. The import figure of 932,000 bbl. daily for the first quarter of this year was 342,000 bbl. daily over the same period last year and 567,000 bbl. daily over the present quota. This difference in imports points out the need for flexibility in the import program. The flexibility is said to be there and the approaching situation should be a fair test of the effectiveness of that feature of the import program.

Even though the import quotas are for a period of 6 months and can be filled at any time during the period, storage costs prohibit heavy early importing without an accompanying advance in the price. The result may be a lagging supply even with new import quotas.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,889,620	UP	19,450	DOWN	17,005
Crude stocks	251,812,000	UP	889,000	DOWN	2,219,000
Completions	1,053	UP	135	DOWN	266
Refinery runs	7,662,000	DOWN	97,000	DOWN	91,000
Gasoline stocks	177,833,000	DOWN	899,000	UP	9,483,000
Kerosine stocks	33,176,000	DOWN	264,000	UP	1,293,000
Distillate stocks	181,445,000	UP	1,455,000	UP	17,529,000
Residual stocks	58,699,000	DOWN	1,046,000	DOWN	9,155,000
Four-product stocks	451,153,000	DOWN	754,000	UP	1,915,000
Total imports	1,577,600	UP	127,200	UP	152,000

U. S. FALL AND WINTER DEMAND FOR RESIDUAL FUEL

(Thousands of barrels daily)

	third quarter	fourth quarter	first quarter	% Change 1st over 4th
1953-54	1,415	1,651	1,732	+ 4.9
1954-55	1,283	1,620	1,866	+ 15.2
1955-56	1,379	1,745	1,888	+ 8.2
1956-57	1,332	1,727	1,941	+ 12.4
1957-58	1,343	1,627	1,759	+ 8.1
1958-59	1,325	1,726	2,088	+ 21.0
1959-60*	1,277	1,700	1,985	+ 16.8

U. S. RESIDUAL FUEL SUPPLY

(Thousands of barrels daily)

	1st quarter Total Demand	Imports	Refinery Production	Transfers	Stock Change	% Yield
1953	1,822	448	1,279	16	— 79	18.4
1954	1,732	434	1,226	15	— 57	17.6
1955	1,866	554	1,219	14	— 79	16.2
1956	1,888	522	1,281	17	— 68	16.0
1957	1,941	568	1,265	29	— 79	15.5
1958	1,759	590	1,070	43	— 56	14.2
1959	2,088	932	1,096	33	— 26	13.1

FALL AND WINTER RESIDUAL DEMAND

East of California

(Thousands of barrels daily)

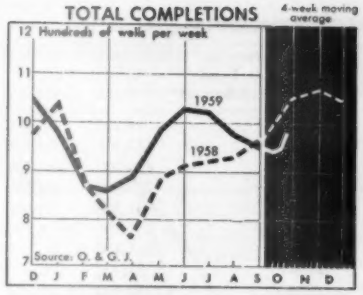
	third quarter	fourth quarter	first quarter	% change 1st over 4th
1953-54	1,064	1,282	1,350	+ 5.3
1954-55	967	1,272	1,431	+ 12.5
1955-56	1,040	1,341	1,494	+ 11.4
1956-57	1,024	1,350	1,544	+ 14.4
1957-58	1,094	1,329	1,474	+ 10.9
1958-59	1,029	1,398	1,751	+ 25.3
1959-60*	1,050	1,400	1,650	+ 17.9

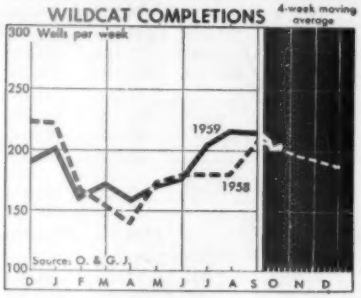
RESIDUAL FUEL SUPPLY EAST OF CALIFORNIA

(Thousands of barrels daily)

	1st quarter Total Demand	Imports	Refinery Production	Transfers	Stock Change	% Yield
1953	1,434	448	912	11	— 63	15.3
1954	1,350	434	851	11	— 54	14.3
1955	1,431	554	839	9	— 29	13.0
1956	1,494	522	904	12	— 56	13.1
1957	1,544	568	880	24	— 72	12.6
1958	1,474	590	762	37	— 85	11.7
1959	1,751	932	807	31	+ 19	11.2

* Estimated





Active Rotary Rigs

	10-26-59	10-19-59	10-27-58
Alabama	6	5	13
Arkansas	12	14	29
Arizona	1	1	2
California	98	101	73
Land	92	96	(*)
Offshore	6	5	(*)
Colorado	48	54	27
Florida	3	3	1
Land	2	2	1
Offshore	1	1	0
Illinois	40	35	55
Indiana	10	8	11
Iowa	0	0	3
Kansas	154	134	146
Kentucky	10	11	14
Louisiana	326	328	311
North	44	43	36
S. Inland waters	108	104	(†)
S. Land	118	123	242
Offshore	56	58	33
Maryland	0	0	1
Michigan	37	37	11
Mississippi	73	74	59
Missouri	0	0	1
Montana	22	21	28
Nebraska	22	22	20
Nevada	1	1	0
New Mexico	121	108	84
New York	0	0	2
North Dakota	21	15	29
Ohio	5	6	4
Oklahoma	218	210	223
Oregon	0	0	0
Pennsylvania	14	12	9
South Dakota	8	8	1
Texas	720	693	744
S. Inland waters	2	1	(†)
S. Land	183	184	151
Offshore	5	2	0
North-East	182	174	167
West Central	208	189	255
West	140	143	171
Utah	28	29	41
Washington	2	2	1
West Virginia	5	7	5
Wyoming	91	89	66
Total U. S.	2,096	2,028	2,014
Western Canada	174	181	147
Eastern Canada	1	1	3
Grand total	2,271	2,210	2,164

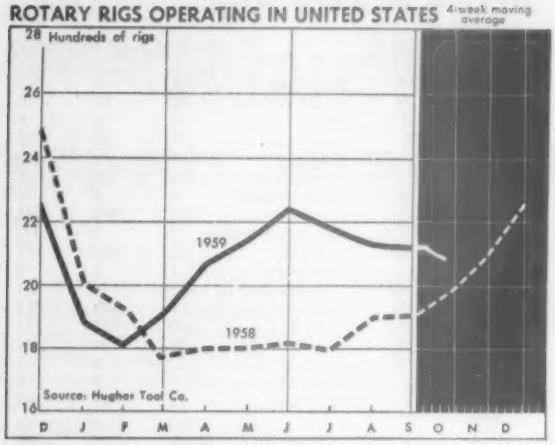
Hughes Tool Co. report. *Comparisons not available due to change in method of reporting. †Included in South-Land.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 24, 1959

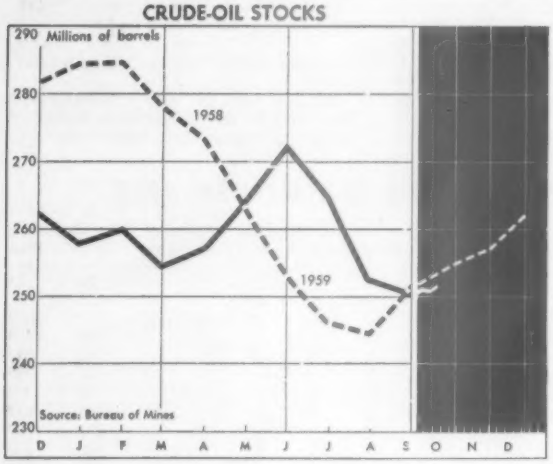
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1959	1958	Total	Crude	Cond.	Gas	Dry	1959	1958
Alabama	0	0	0	0	0	0	0	78	62	0	0	0	0	0	20	24
Arizona	0	0	0	0	0	0	0	23	...	0	0	0	0	0	21	...
Arkansas	15	7	0	1	7	0	58,651	684	646	3	0	0	0	3	121	134
California	38	22	0	1	14	1	180,972	1,244	1,255	9	1	0	0	8	326	303
Colorado	7	1	0	2	4	0	42,267	619	684	4	0	0	1	3	362	397
Illinois	42	14	0	0	28	0	81,177	1,838	1,840	15	1	0	0	14	310	369
Indiana	45	15	0	0	30	0	66,696	692	672	15	0	0	0	15	237	242
Kansas	65	19	0	2	44	0	233,090	3,236	3,137	26	5	0	2	19	845	658
Kentucky	180	132	0	3	45	0	148,588	2,106	1,401	26	2	0	0	24	258	133
Louisiana	79	24	3	7	45	0	495,209	3,057	2,805	16	0	0	0	16	420	422
North	41	11	0	5	25	0	170,837	1,196	1,063	11	0	0	0	11	189	181
South	32	9	2	2	19	0	260,653	1,532	1,385	5	0	0	0	5	216	217
Offshore	6	4	1	0	1	0	63,719	329	357	0	0	0	0	0	15	24
Michigan	25	11	0	1	13	0	85,974	523	354	11	0	0	1	10	140	116
Mississippi	16	4	1	0	11	0	157,747	516	315	5	0	0	0	5	228	144
Montana	18	5	0	2	11	0	75,219	266	273	6	0	0	1	5	88	109
Nebraska	13	3	0	0	10	0	80,081	730	588	6	0	0	0	6	313	276
New Mexico	35	19	2	5	5	4	134,979	1,685	1,598	5	0	0	0	5	198	220
West	19	6	2	5	2	4	63,608	757	783	2	0	0	0	2	53	89
East	16	13	0	0	3	0	71,371	928	815	3	0	0	0	3	145	131
New York	0	0	0	0	0	0	0	217	445	0	0	0	0	0	19	39
North Dakota	6	4	0	0	2	0	32,848	367	384	0	0	0	0	0	67	122
Ohio	42	25	0	6	10	1	72,160	844	838	1	0	0	0	1	24	12
Oklahoma	69	30	1	2	32	4	258,034	4,542	5,182	7	1	0	0	6	696	708
Pennsylvania	0	0	0	0	0	0	0	441	473	0	0	0	0	0	10	16
South Dakota	1	0	0	0	1	0	8,644	15	...	1	0	0	0	1	7	...
Texas	335	177	8	24	119	7	1,338,711	15,333	14,632	62	1	2	4	55	2,889	2,999
Dist. 1	14	5	0	0	9	0	38,519	879	812	8	0	0	0	8	267	323
Dist. 2	18	3	1	5	9	0	117,640	645	615	9	0	0	2	7	189	160
Dist. 3	19	9	1	0	9	0	116,124	979	1,039	2	0	1	0	1	195	234
Dist. 4	20	9	2	1	8	0	94,347	1,089	945	3	0	0	0	3	266	286
East	23	14	1	2	6	0	73,623	1,035	997	4	0	0	0	4	198	277
Dist. 7-B	61	22	0	2	37	0	177,060	2,115	2,012	16	1	0	2	13	570	566
West	77	58	0	1	17	1	393,272	4,630	4,171	10	0	0	0	10	635	589
Dist. 9	81	43	2	10	20	6	246,077	2,896	2,970	9	0	1	0	8	480	474
Dist. 10	22	14	1	3	4	0	82,049	1,065	1,071	1	0	0	0	1	89	100
Utah	2	0	0	0	2	0	11,113	246	306	2	0	0	0	2	67	74
West Virginia	11	0	0	9	2	0	31,651	634	615	1	0	0	1	0	27	15
Wyoming	9	2	0	0	7	0	58,850	774	614	5	0	0	0	5	272	195
Miscellaneous	0	0	0	0	0	0	0	80	79	0	0	0	0	0	53	69
Total U. S.	1,053	514	15	65	442	17	3,652,661	40,790	39,198	226	11	2	10	203	8,018	7,796
Previous week	918	431	29	98	342	18	3,811,349	.....	.....	202	25	1	7	169	.....	.....
Cum. 1959	40,790	20,237	997	3,034	15,387	1,135	169,177,748	.....	.....	8,018	727	94	261	6,936	.....	.....
Cum. 1958	39,198	19,305	915	2,944	14,995	1,039	159,957,245	.....	.....	7,796	759	133	212	6,692	.....	.....
Western Canada	41	20	0	4	14	3	206,190	1,975	2,015	8	0	0	2	6	551	533

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	10-17-59	10-10-59	10-18-58
Pennsylvania	2,559	2,583	2,767
Other Appalachian	2,099	2,131	1,809
Illinois, Indiana, Michigan	9,553	9,551	9,356
Nebraska and North Dakota	3,189	3,060	2,920
Kansas	9,840	9,787	9,708
Oklahoma	14,473	14,323	17,107
Arkansas	2,018	2,082	1,990
Louisiana	17,695	17,989	17,306
North	3,172	3,272	2,933
South	14,523	14,717	14,373
Mississippi, Alabama, Florida	2,068	2,434	2,551
New Mexico	8,167	7,758	8,212
Texas	110,759	108,777	108,819
East Texas	8,074	8,098	8,066
West Texas	51,398	50,943	53,246
Texas Gulf	20,431	19,109	19,617
Other Texas	30,856	30,627	27,890
Wyoming	16,214	16,399	13,196
Other Rocky Mountain	9,535	9,511	9,399
California	28,945	28,885	33,134
Foreign	†14,698	15,653	15,757
Total	**251,812**	250,923	254,031

*Bureau of Mines. †Includes 4,177,000 bbl. in California.

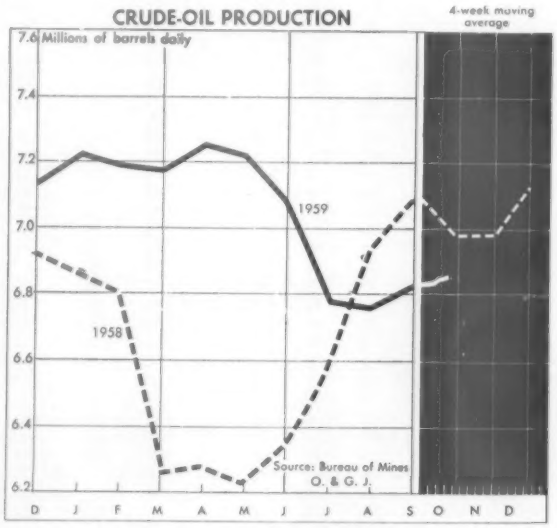
DAILY AVERAGE PRODUCTION FOR WEEK

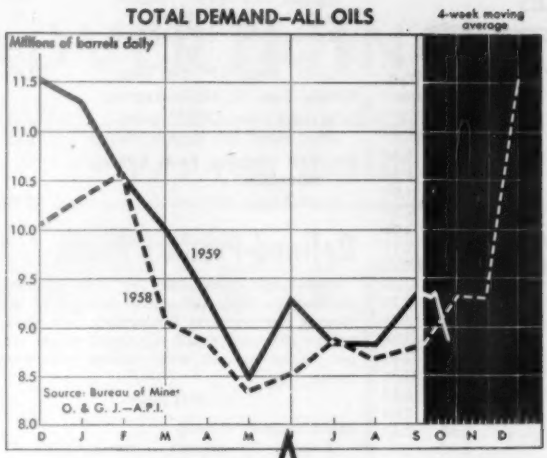
	October 24, 1959			Oct. 17
	Crude oil	Lease condensate	Total	total
Alabama	16,100	.....	16,100	16,050
Arkansas	52,250	300	52,550	52,500
California	838,700	.....	838,700	842,200
Colorado	127,000	.....	127,000	126,600
Eastern	41,000	.....	41,000	43,000
Florida	1,150	.....	1,150	1,150
Illinois	213,800	.....	213,800	213,400
Indiana	31,400	.....	31,400	31,100
Kansas	†332,580	.....	†332,580	†323,080
Kentucky	76,500	.....	76,500	75,300
Louisiana	912,150	107,650	1,019,800	1,019,350
North	108,150	5,400	113,550	113,100
South	804,000	102,250	906,250	906,250
Michigan	31,300	.....	31,300	31,300
Mississippi	137,630	4,100	141,730	141,730
Montana	81,900	.....	81,900	82,400
Nebraska	66,800	.....	66,800	67,000
Nevada	100	.....	100	100
New Mexico	287,200	5,200	292,400	292,400
North Dakota	47,000	.....	47,000	51,200
Oklahoma	†534,200	.....	†534,200	†516,700
Texas	2,410,000	75,600	2,485,600	2,485,600
Dist. 1	42,000	2,500	44,500	44,500
Dist. 2	102,000	7,700	109,700	109,700
Dist. 3	314,000	37,000	351,000	351,000
Dist. 4	170,000	8,600	178,600	178,600
Dist. 5	27,000	300	27,300	27,300
Dist. 6	103,000	9,000	112,000	112,000
East Texas field	130,000	.....	130,000	130,000
Dist. 7B	132,000	170	132,170	132,170
Dist. 7-C	115,000	3,230	118,230	118,230
Dist. 8	968,000	4,500	972,500	972,500
Dist. 9	200,000	1,600	201,600	201,600
Dist. 10	107,000	1,000	108,000	108,000
Utah	107,800	.....	107,800	108,400
Wyoming	349,800	.....	349,800	349,200
Others	‡410	.....	‡410	‡410
Total U. S.	6,696,770	192,850	**6,889,620**	6,870,170
Change from prev. week up	.....	.....	**19,450**	.....
Canada	†525,305	.....	†525,305	†539,700

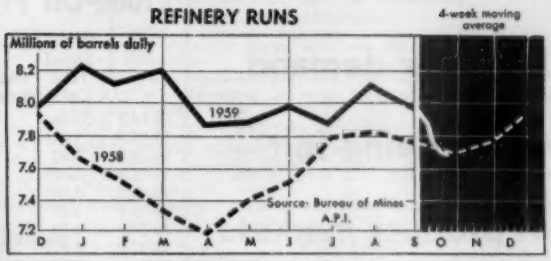
Total U. S. prod., Jan. 1-Oct. 24 ..... 2,092,986,530 bbl.
Same period last year (crude plus cond.) ..... *1,969,292,170 bbl.

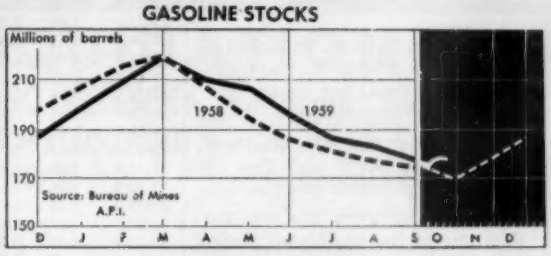
*Includes 46,932,130 bbl. condensate. †Week ended previous Monday. ‡Arizona, South Dakota and Washington.

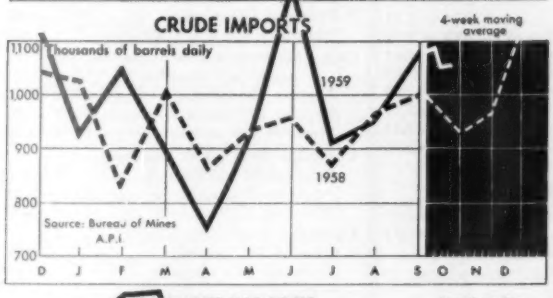
CRUDE-OIL PRODUCTION

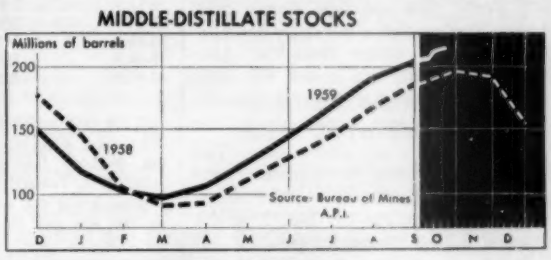


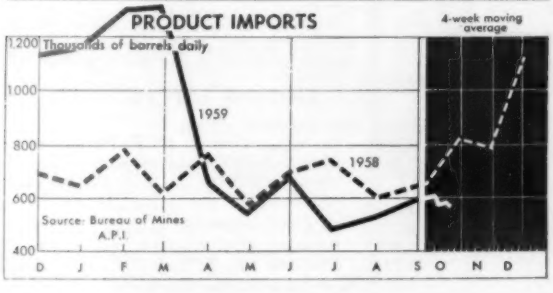


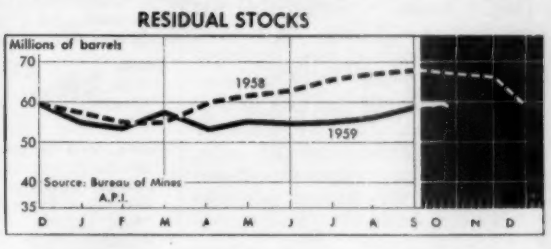












API REFINERY REPORT—OCTOBER 23, 1959

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1958 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	985	432.9	17.7	335.0	129.1	40,686	14,039	71,967	12,305	1,071	483.9	25.4	326.5	152.6
Appalachian:														
District 1	95	44.6	3.3	16.7	13.0	6,043	704	4,941	463	102	42.5	4.2	21.9	9.5
District 2	104	53.4	4.6	21.3	8.6	2,695	596	2,102	478	103	49.9	6.0	18.2	13.6
Ind., Ill., Ky.	1,467	751.9	60.4	326.1	140.3	30,846	7,240	30,147	6,656	1,363	702.7	59.7	287.6	142.0
Minn., Wis., Dak.	59	25.3	0.4	18.0	10.6	6,851	1,470	8,187	435	60	25.8	3.3	15.4	8.2
Okla., Kans., Mo.	709	397.6	16.6	188.0	14.3	17,455	1,618	12,829	948	667	373.4	11.6	163.2	24.7
Inland Texas	294	235.7	10.0	50.9	19.1	7,048	603	1,770	2,362	281	197.6	8.4	50.6	23.6
Tex. Gulf Coast	1,727	917.7	128.0	416.4	136.7	21,374	3,358	21,472	6,204	1,845	958.0	119.3	504.4	199.9
La. Gulf Coast	673	353.0	53.4	150.7	46.1	9,390	1,521	7,621	1,444	676	378.5	60.6	164.4	45.6
N. La. and Ark.	69	42.1	2.6	13.9	4.6	4,664	1,307	2,387	304	97	42.0	6.1	21.5	6.6
Rocky Mountain:														
New Mexico	27	19.4	0.7	4.3	3.4	895	53	198	42	23	12.1	0	4.6	2.4
Other Rky Mtn.	267	128.9	4.3	54.8	32.3	4,468	351	2,793	1,322	276	129.4	3.2	65.2	33.0
West Coast	1,186	488.4	3.7	154.3	285.0	25,418	316	15,031	25,736	1,136	504.2	7.6	174.9	297.4
Oct. 23, 1959	7,662	3,890.9	305.7	1,750.4	843.1	177,833	33,176	181,445	58,699	7,700	3,900.0	315.4	1,818.4	959.1
Oct. 16, 1959	7,759	4,015.9	308.1	1,685.1	857.0	178,732	33,440	179,990	§59,745	.....	.....	.....	.....	.....
Oct. 24, 1958	7,753	3,935.1	360.4	1,724.4	1,032.4	168,350	31,883	163,916	67,854	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Revised.

Stronger demand tones being felt in product markets

PRODUCTS MARKETS picked up a stronger tone in both the Mid-Continent and Gulf Coast last week.

First really chill weather of the season moved into the heating-oil country of the North and East. It meant a slight pickup in distillate sales but nothing spectacular yet.

Real test of the heating-oil market will come with the first severe cold wave. The weather since early September has been colder than the same period last year, but it still will take some freezing nights to remind householders their fuel tanks should be filled.

Until this strong demand develops, Mid-Continent refiners will be fortunate to hold prices for No. 2 in the present 8.25-8.50-cent range.

No. 1 distillate remained firm last week at 9 to 9.25 cents and demand for the fuel continued good. Principal reason was its greater use in jet planes.

Gasoline demand also held up well during the week. The market actually took on a better tone in many areas, although no price improvement was noted immediately. Refiners in Group 3 still were getting 10.75 to 11 cents for 91-octane regular.

The good demand is attributed to high level of autumn farm work in the Mid-Continent and to good motoring weather.

Marketers also noted with interest the statement of Jersey Standard President Morris J. Rathbone that his company planned in the future to buy products to meet exceptional needs rather than expand plant capacity. If this becomes a trend followed by other majors, it well could solve the industry's overcapacity in processing facilities.

This interest of marketers points up to the big need of working down high stocks in the next 2 months. The IPAA supply and demand committee predicted the average daily withdrawal from stocks in the fourth quarter would be 618,000 bbl. This compares with a 135,000-bbl. daily gain in inventories during the third quarter.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill§ Calif.	Oklahoma	Gulf Coast Tex.*	West Tex.† N.M.	Wyo. (sour)
14-14.9	$1.76	....	....	....	....
15-15.9	1.84	....	....	....	$1.81
16-16.9	1.92	....	....	....	1.86
17-17.9	2.00	....	....	....	1.91
18-18.9	2.08	....	....	....	1.96
19-19.9	2.16	....	....	....	2.01
20-20.9	2.24	$2.49	....	$2.35	2.06
21-21.9	2.32	2.52	....	2.38	2.11
22-22.9	2.39	2.55	....	2.41	2.16
23-23.9	2.46	2.58	$3.44	2.44	2.21
24-24.9	2.53	2.61	3.46	2.47	2.26
25-25.9	2.60	2.64	3.48	2.50	2.31
26-26.9	2.67	2.67	3.50	2.53	2.36
27-27.9	2.74	2.70	3.52	2.56	2.49
28-28.9	2.81	2.73	3.54	2.59	2.54
29-29.9	2.87	2.76	3.56	2.62	2.59
30-30.9	2.93	2.79	....	2.65	2.63
31-31.9	3.00	2.82	....	2.68	2.67
32-32.9	3.06	2.85	....	2.71	2.71
33-33.9	3.12	2.88	....	2.74	2.75
34-34.9	3.17	2.91	....	2.77	2.79
35-35.9	3.22	2.94	....	2.80	2.83
36-36.9	3.27	2.97	....	2.83	2.87
37-37.9	3.31	2.99	....	2.86	2.89
38-38.9	....	3.01	....	2.89	2.91
39-39.9	....	3.03	....	2.92	2.93
40-40.9	....	3.05	....	2.95	2.95

*Low cold test crude. †Sour.

Effective dates of broad changes: California, 9-11-59; East of California, January 3-10, 1957; Pennsylvania Grade 9-12-59.

§Union Oil Co. of California posting up to 25c less per barrel.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.40
Middle District	4.22
Southwest Pennsylvania	3.95
West Virginia	3.77
Buckeye Grade	3.62
Illinois Basin	3.00

FOREIGN

Canada:	
Leduc-Woodbend	2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.34
San Joaquin, 41°-41.9°, Puerto La Cruz	3.08-3.10
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes f.o.b. lifting port):	
Arabian, about 34°, Ras Tanura	$1.89
Iranian, 34.0°-34.9°, Bandar Masur	1.86
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05
Middle East, E. Mediterranean:	
Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.57

Refined-Product Prices

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (91 octane)	10.75-11.25
Premium (99 octane)	13.50-14.00
Natural gasoline (26-70)	4.5
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.50-10.75
Regular (92 octane)	10.75-11.00
Premium (98 octane)	12.00-12.25
California (rack) (Los Angeles):	
Regular (88 octane)	11.65-12.25
Premium (94 octane)	12.65-13.25
Premium (100 octane)	14.15-14.50
Caribbean area (cargoes):	
Regular (87 octane)	10.375
Premium (97 octane)	12.00

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.25-9.50
Diesel oil (58 d.i. and above)	9.00-9.25
Distillate No. 1	9.00-9.25
Distillate No. 2	8.25-8.50
Gulf Coast (cargoes):	
Kerosine 41-43	8.625
Distillate No. 2	8.125
New York Harbor (barges):	
Kerosine 41-43	9.60
Distillate No. 2	9.10
Diesel fuel, 48-52 d.i.	9.40
Caribbean area (cargoes):	
Distillate No. 2	8.125

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.40-1.60
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
Bunker C fuel	$2.17-2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

★ Carib.-USNH, dirty (ATRS—55%)	$1.24
★ Carib.-UK, clean (ATRS—42.5%)	3.74
★ Carib.-UK, dirty (Scale—52.5%) (15s. 5d.)	2.16
★ PG-Japan, dirty (USMC—68%)	3.26

★Denotes change from previous week.

CLASSIFIED ADVERTISING

for the oil and gas industry

. . . your market place

RATES:
UNDISPLAYED CLASSIFIED 28c a word issue. 10% discount three or more consecutive issues. $5.00 minimum charge. Blind Box in our care nine words. Payable in advance.

DISPLAY CLASSIFIED
$19.00 a column inch one issue . . .
10% Discount three or more consecutive issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

EXCEPT . . .

WESTERN STATES: (California, Washington, Oregon, Idaho, Nevada, Utah, and Arizona) Write: Classified Departments, Inc., The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif. Phone AXminister 2-0287.

FOR SALE EQUIPMENT

1 BUCYRUS—ERIE 36L Spudder, late model. Rig complete with tools and equipment. Cassel Drilling Co. Inc., Dumas, Texas. Phone WE 5-5019 or WE 5-4369.

FOR SALE—Late model 36-L Bucyrus Erie drilling machine and complete tools. Excellent condition. $13,500. S. C. Jensen, 501 N. Ward, Pampa, Texas. Phone MOhawk 5-5993.

—PIPE—
500,000 ft. 10¾" O.D. 35#
200,000 ft. 8⅝" O.D. 28 1/2#
100,000 ft. 12¾" O.D. 40#
20,000 ft. 16" O.D. 42#
all No. 1 grade, plain end cleaned
INDIANA-OHIO PIPE CO.
P. O. Box 5412 Shepard Sta.
Phone C.L. 3-5527.
Columbus 3, Ohio.

NEW 8" LINE PIPE

(Immed. Delivery)

32,000 ft. 8⅝" O.D., .188 Wall, 16.90# API 5-L Grade B Electricweld Steel Line Pipe, DRL, Beveled.

Priced attractively for prompt shipment, Houston, Texas.

MID-STATES PIPE & SUPPLY CO.
P. O. Box 2534 Phone LU 2-9128
Tulsa 1, Oklahoma

PIPE FOR SALE

18,000 ft. 3½" O.D. 7.58# No. 1 Grade Used L.W. Line Pipe, P.E. Beveled.
20,900 ft. 4" O.D. x .156w, 6.41# Used Seamless Tubes, approx. 40' lengths, P.E. Beveled
40,000 ft. 4½" O.D. x .237w, 10.79# Used No. 1 Grade L.W. Line pipe, P.E.B.
3,800 ft. 4½" O.D. x .165w, 8.63# Used Line Pipe, No. 1 Grade, P.E.B.
7,000 ft. 6⅝" O.D. x .188w, 12.89# Used L.W. Line Pipe, P.E.B.
4,000 ft. 6⅝" O.D. x .280w, 18.97# New E.W. Grade B, Limited Service Line Pipe P.E.B.
9,100 ft. 7" O.D. x .362w, 28#, New Seamless Limited Service Casing, P.E.B. Range 3.
2,700 ft. 8⅝" O.D. x .322w, 28.55# Seamless Grade B, New Limited Service Line Pipe, P.E.B. Range 3.
3,400 ft. 8⅝" O.D. x .352w, 31.10# New Limited Service H-40 Casing, P.E.B.
1,000 ft. 8⅝" O.D. x .500w, 43.39# Used Seamless, No. 1 Grade Line Pipe, P.E.B.
1,650 ft. 10¾" O.D. x .365w, 40.48#, New, E.W. Limited Service Grade B, Line Pipe, P.E.B.
90,000 ft. 12¾" O.D. x .375w, 49.56# Used, L.W. Line Pipe, P.E.B.
14,000 ft. 18" O.D. x 11/64"w, Armco Spiralweld, Used Line Pipe, Range 3, No. 1 Grade.
2,450 ft. 18" O.D. x .312w, 59.03#, New, Seamless, Limited Service Line Pipe, P.E.B. Range 3.
25,300 ft. 16" O.D. x .344w, 57.48# used L.W. Line Pipe P.E. Beveled.
14,200 ft. 24" O.D. x 11/64w, Armco Spiralweld Used Line Pipe, Range 3, Excellent Grade.

All above items and many other pipe sizes of various wall thickness available for immediate delivery.

Please Write or Call
MID-STATES PIPE & SUPPLY CO.
OF LOUISIANA
LU 2-7231 Tulsa, Okla. P. O. Box 415

FOR SALE EQUIPMENT

LIQUIDATION

at ESSO REFINERY, Baltimore, Md.

MOST EQUIPMENT NEW 1955

TOWERS

10' x 145'—125 PSI 50 trays
9' 6" x 121' 6"—325 PSI 30 trays
9' 6" x 106' 7"—150 PSI 20 trays
8' 6" x 103' 6'—165 PSI 24 trays
7' x 82'—75 PSI 30 trays
6' x 80'—300 PSI 30 trays
4' x 44' 6"—150 PSI 12 trays
3' 6" x 36' 4"—400 PSI 12 trays
3' x 29'—378 PSI 14 trays
30" x 43' 6"—180 PSI 24 trays
30" x 48'—350 PSI Packed
30" x 52' 4"—360 PSI 22 trays
26" x 57'—78 PSI 4 trays

REBOILERS

Sq. Ft.	Dimension	Tubes	PSI
2700	58" x 23' 5"	¾" Admir	150
2100	37" x 192"	1" Steel	165
2050	36" x 216"	¾" Admir	150
1020	32" x 196"	1¼" Steel	175
768	22" x 192"	¾" Steel	300
625	60" x 24'	1" Cu Ni	85
456	20" x 27'	¾" Steel	375

HEAT EXCHANGERS AND CONDENSERS

Steel	tube	7500	to	100	sq. ft.
Adm.	tube	3500	to	236	sq. ft.
Cu. Ni	tube	2330	to	308	sq. ft.

INGERSOLL RAND BLOWERS

1—2000 HP Motor Driven 26700 CFM 15 PSIG Discharge
2—1700 HP Turbine Driven 22500 CFM 15 PSIG Discharge

PUMPS

HOT OIL—5150 GPM to 100 GPM
Motor and Turbine driven
CENTRIFUGAL—12650 GPM to 25 GPM
Motor and Turbine driven
STEAM—Simplex and Duplex (20)

PRESSURE DRUMS

12' x 50' to 4' x 10'—325 to 50 PSI

FURNACE TUBES

68—6" x ⅜" x 27' 6", 3.75% Ni 8% Cr.
144—4" x ⅜" x 29' Croloy 5

TRANSFORMERS

750 KVA Standard 2400/4160-480
333 KVA Maloney 2400/4160-480
250 KVA Maloney 2400/4160-480

CLARK COMPRESSORS

1—Two Stage CENTRIFUGAL
7860 CFM-153 PSIA 2000 HP
3—RA5 Gas Engine with
2 VTH 17" x 14" Cylinders

OTHER HIGHLIGHTS

REACTOR—23' x 70' Stainless lined
HOPPERS—Catalyst 25' x 70'
FLARE TOWER—300' high
MOTORS & STARTERS—Ex. Pf. (200)
REACTORS—(3) 8' x 32' 6" (1) 8' x 88'
STORAGE TANKS—7000 bbl. Welded
ELEVATORS—Passenger & Freight
STEEL PIPE—2" to 30" 1500 TON
INSTRUMENTS—Controlling, Indicating, Transmitting (1000)

10,000 BBL/DAY FLUID COKING UNIT

Complete with all Equipment and Accessories
Still on Foundations — *NEW 1955*

Hundreds of other items—send for complete catalog

HEAT & POWER CO., Inc.

Site Office—Boston & Haven Sts., P. O. Box 5203, Baltimore 24, Md., Dickens 2-0224
New York Office—60 East 42nd Street, New York 17, N. Y., MUrray Hill 7-5280
Tulsa Office—306 Thompson Bldg., Tulsa 3, Okla., Diamond 3-4890

SALES AGENTS FOR LIPSETT, INC.

FOR SALE EQUIPMENT

3 COMPLETE UNIT rigs for sale. U-18 drawworks. 2 Rigs are powered by 3 NKU Waukesha engines. 1 rig powered by 2 LRO Waukesha engines. Drill pipe and collars optional. Rigs may be seen at Henson Drilling Company yard in Abilene, Texas. Complete inventory on request.

FOR SALE EQUIPMENT

16" AND 20", good used pipe. Very attractive prices. Contact: The Tri-State Pipe Co., Bellaire, Ohio. Telephone OR 6-1452.

1500 FAILING heavy duty, complete, Franks 1000. Core barrels. 3½" hex. Kellys, $250.00. Fred Butler, Box 481, Pueblo, Colo.

FOR SALE EQUIPMENT

ONE 36 L BUCYRUS Erie Spudder, trailer mounted, equipped with air brakes. Skid Mounted Dog House, Butane tank and crane with roller. Complete with lines and tools. Kent Well Servicing Company, El Dorado, Kansas.

WELL DRILLS—CORE DRILLS. Everything for well and core drilling in both new and used equipment at money saving prices. Fishing tools rented. Send for bulletins. Pressey & Son, Pueblo, Colo.

FOR SALE—133' IDECO Full View Portable Mast, 9' Substructure. Wilson Giant single drum drawworks, complete with two engine compound, Oilwell 20½" rotary table with torque converter, 7½ x 16 Bethlehem G-300 Pump. Excellent condition guaranteed. Kirkpatrick Oil Co., 1300 N. Broadway, Oklahoma City, Phone CE 9-1416.

THREE 3½ to 6X10, Model HDPP-KPS Pot Valve Worthington pipe line pumps driven by Model HXE-135 H.P. Hercules engines. Mounted on 8 inch H beam skids. In A-1 shape. Price $3500.00 per unit. Oil Field Material Co. Box 307, Selman City, Texas. Phone Turnertown 5-2675.

ATTENTION HEAVY HAULERS

20% Less Than Dealer Cost

5 New Trucks

NEVER BEEN USED

1—1957 IHC RDF 214-H Long wheel base-NHB 600 Cummins Engine. 37,000 pound tandem rear axles.

2—1958 IHC VFP 214 A Long wheel base. V549 LPG Engine-dual front steering axles with power steering. 37,000 pound tandem rear axles.

1—1958 White WC 2464 Long wheel base. White 390A LPG engine. Dual front steering axles with power steering. 38,000 lb. rear tandem axles.

1—1958 IHC VFP 230-Long Wheel Base. V549 LPG engine. 50,000 lb. tandem rear axles, dual front steering axles with power steering.

The above trucks are surplus to our current requirements. For additional information, contact:

Mr. Al Schroeder

at

CARDWELL MANUFACTURING COMPANY

801 South Wichita — Wichita, Kansas

or call your nearest Cardwell Representative.

5400' 3½" O. D. EUE J-55 8rd, 9.30#/ft., Range 2, Seamless Tubing. Excellent Condition—"in the hole" three days.

Frac Tubing Rentals, Inc.

P. O. Box 672, Fittstown, Oklahoma
Phone 2271

FOR SALE:

THE FOLLOWING USED CASING AND TUBING IN GOOD CONDITION

20,000'—3½" O.D. 8.7# Seamless Range 1 11½ thread tubing
12,000'—3½" O.D. 9.2# Seamless Range 1 11½ thread tubing
10,500'—5½" O.D. Lap weld 17# Range 1 11½ thread casing
17,000'—5½" O.D. Seamless 17# Range 1 11½ thread casing
1,850'—7" O.D. Lap weld 20# Range 1 8 round thread casing
4,000'—8⅝" O.D. Lap weld 24# Range 1 8 round thread casing

If interested, write or phone.

THE EAST OHIO GAS COMPANY

East Ninth at Superior Avenue
Cleveland 14, Ohio
F. C. Durst, Purchasing Agent
TOwer 1-2960

LIQUIDATION

OF AMOCO REFINERY, DESTREHAN, LA.

175 TANKS, 500 bbl. to 80,000 bbl.
Also large quantity of Tank Plate—all at tremendous savings.

- 19,000 BBL. CAT CRACKER (1953)
- 2,000 BBL. ALKYLATION (1953)
- 5—B&W BOILERS, 70,000 #/hr. 500 PSI. (1952)
- 90—TOWERS & VESSELS, 2' to 12' dia. and 30' to 110' high
- 80—HEAT EXCHANGERS, 78 to 6,100 sq. ft.
- 3,170 CFM I-R 2-STAGE COMPRESSOR. Type HHE-2. 125 PSI. 600 HP Syn. Motor
- 5—FURNACES 11.4 MM to 15 MM BTU per hour
- 150 CENTRIFUGAL, HOT OIL and STEAM PUMPS
- 2—CARRIER CENTRIFUGAL COMPRESSORS, 38,300 CFM and 9,370 CFM with 3,370 HP and 2,310 HP TURBINES
- 500 INSTRUMENTS; RECORDING, CONTROLLING, ETC.
- TETRA ETHYL weighing Station with 8,500 weighing tank.

Warehouse Stocks—Unused Material.

Pump parts, valves, fittings, electrical supplies and condenser tubing.

WRITE • WIRE • PHONE TODAY

BE BRILL ESTABLISHED 1926 **EQUIPMENT COMPANY**

2401 THIRD AVE., N. Y. 51, N. Y. — CYPRESS 2-5703
4101 SAN JACINTO, HOUSTON, TEXAS — JACKSON 6-1351

Liquidation Site Office—Destrehan, La.—Telephone Norco 6571

NEW PRIME LINE PIPE

Available For Prompt Shipment

19,275 ft. 8⅝" O.D. x .277w, 24.7#, E.W. A.P.I. 5-L x 52, Range 3, P.E.B.
5,200 ft. 8⅝" O.D. x .322w, 28.55# E.W. and S.S., A.P.I. 5-L Grade B, Range 3, P.E. Beveled.
1,500 ft. 12¾" O.D. x .375w, 49.56#, E.W. A.P.I. 5-L x 42, Range 3, P.E.B.
19,200 ft. 16" O.D. x .375w, 62.58#, E.W. A.P.I. 5-L Grade B, 35,000# min. yield, Range 3, P.E.B.
4,425 ft. 16" O.D. x .375w, 62.58#, E.W. A.P.I. 5-L x 42, 42,000# min. yield, Range 3, P.E. Beveled.
2,150 ft. 16" O.D. x .406w, 67.68#, E.W. A.P.I. 5-L x 42, Range 3, P.E.B.
1,980 ft. 18" O.D. x .312w, 59.03# E.W. A.P.I. 5-L x 46, Range 3, P.E.B.
57,000 ft. 30" O.D. x .375w, 118.85#, E.W. Prime Grade, A.P.I. 5-L x 52, 52,000# min. yield, Range 3, P.E.B. used Line Pipe (Just Like New).

Many Other Sizes Available

MID-STATES PIPE & SUPPLY CO. OF LOUISIANA

LU 2-7231 Tulsa, Okla. P. O. Box 415

FOR SALE EQUIPMENT

IN STOCK FOR IMMEDIATELY SALE

Located in Louisiana

80,000' 16" O. D. .312" Wall, 52.36#

Grade 5L-X52

NEW PLAIN END DRLG.-LINE PIPE

Domestic Mfgr.

Very Attractive Price

AMERICAN PIPE & SUPPLY CO.

435 W. 1st., Casper, Wyo., Phone 2-1545

14-17 LB. Five inch casing J 55 seven thousand feet. Two inch upset tubing for deep wells. Three quarter rods. Two pump jacks, Jensen. Witte engines. Seven inch casing 20 lb. Telephone 9742, Port Clinton, Ohio.

BUCYRUS ERIE 36-L. Year 49 late model. Skid mounted with diesel. 4,000 feet good line. Three complete strings of tools, steel doghouse with hand tools, diesel light plant. Rigged for quick and efficient move. Machine in good condition. Price: $9,000.00 cash. Box L-557, The Oil and Gas Journal, Tulsa, Oklahoma.

TURBO EXHAUSTERS for sale (1)—IR 15,360 CFM @ 4.8# discharge pressure with 454 HP steam turbine; (1)—IR 17,000 CFM @ 4.15# discharge pressure with 678 HP steam turbine. Excellent condition, priced for quick sale. Brill Equipment Co., 2401 Third Ave., New York 51, New York. Phone CYpress 2-5703.

2-USED PUMPING UNITS in good condition; 80,000# capacity w/motors; 12,500 feet misc. sucker rods ⅝" to ¾"; 10,000 feet 4½" J-55 R-2 8RT casing; 5,000 feet 5½" J-55 R-2 8RT casing. F.O.B. Sterling, Colo. Miers Well Service Inc., LA 2-3696 Sterling, Colo. Box 325.

PORTABLE DRILLING RIG— Double drum Franks 7000, mounted on heavy duty tandem trailer, 90' open faced derrick 200,000# capacity. This rig complete and ready to work. 5500'-3½" drill pipe, 7¼ x 12 G. D. pump, complete inventory sent at your request. $48,500.00 F.O.B. Sterling, Colo. Miers Well Service Inc., LA 2-3696, Sterling, Colo. Box 325.

PIPE FOR SALE

5,000 Feet 5½" O.D. 17# N-80 Range 3, Youngstown Speedtite Hydrill thread, used Tuboscope Grade 2.
5,600 Feet 5½" O.D. 17# J-55 Range 3 Youngstown new Speedtite Hydrill thread.

Write or Call

ARNOLD PIPE & SUPPLY CO.
3815 Greenwood Road
Phone MElrose 5-1377
Shreveport, Louisiana

NEW 16" O.D. PIPE

4,600 ft. 16" O.D., .188 Wall, 31.66# Armco Spiralweld Steel Pipe, Manufactured to ASTM specification A-139, Grade B, lined, coated and wrapped in accordance with AWWA C-203 specifications, 50 ft. lengths with ends prepared for Dresser couplings.

Priced Attractively for Quick Sale from Tulsa, Oklahoma.

MID-STATES PIPE & SUPPLY CO.
P. O. Box 2534 Phone LU 2-9128
Tulsa 1, Oklahoma

FOR SALE EQUIPMENT

FOR SALE or TRADE—For Production, Casing or Land. 5000' Rotary complete ready to work. Phone O. R. 7-2242, Box 4294, Oklahoma City 9, Okla.

---

6 USED CLARK Type VSF 3⅜" x 14" forged steel compressor cylinders. 3400 p.s.i. working pressure. Excellent condition. Santa Rosa Gas Company, Driscoll Building, Corpus Christi, Texas.

FOR Sale 1000 tons used steel plates in Ohio and Pennsylvania. These plates have been dismantled from oil tanks. Will sell all or any amount. For information contact: West Ohio Pipe Company, Box 193, Lima, Ohio. Phone CA 6-0821.

55—STORAGE TANKS 30,000, 55,000, and 80,000 bbl. capacities, some with floating heads, excellent condition, lowest prices, immediate shipment. Box L-553, The Oil and Gas Journal, Tulsa, Oklahoma.

5,000 METRIC TONS of high quality welded steel tubes (Martin Steel) in 8-12 meter lengths D=600 E=9m/m weight 133 kilos the meter. Priced at 185 metric ton FOB Bordeaux France. Same tubes used in French Sahara oil fields. Delivery guaranteed for shipment in port 7 days after order. Mr. Mac Masters. Anciens Etablissements Pierre Gauthier 41, Bis Rue De Chateaudun, Paris IX, France.

REASONABLY PRICED API PIPE
RECONDITIONED
3310' 5½" O.D. 14# 8R ST&C Rg. 2 Csg.
6800' 2⅜" O.D. 4.7# 8R EUE Rg 2 Tubing
Mixed N80 & J55 tested 5000#
UNUSED
4014' 2⅞" O.D. 6.5# Hydril C5 thd. tubing
Tube Coated Rg. 2 N80
DAYTON PIPE COMPANY
Box 445, CL 8-2654 Dayton, Texas

BANKRUPTCY SALE by Public Auction of Keta Gas & Company, on the premises Luthersburg Warehouse, Luthersburg, Penn. (Near Pittsburgh) November 17, 1959 consisting of 6 Spudders, 3 Rotary Drills, large quantity of Pipe and Drilling Equipment. For Information Brochure contact American Industrial Auctioneering Co. Inc., 1210 Chamber of Commerce Bldg., Buffalo 2, New York, or Phone Buffalo, MOhawk 2050, Matthew J. Anderson, Auctioneer.

NEW LINE PIPE

(Limited Service)

11,000' 16" O.D. .281 Wall 47.2#
11,000' 12¾" O.D. .250 Wall 33.23#
3,000' 16" O.D. .312 Wall 52.35#

All Electricweld, Mill Tested, app. 40' DRL, beveled. Priced attractively for prompt shipment, Detroit, Michigan.

MID-STATES PIPE & SUPPLY CO.
P. O. Box 2534 Phone LU 2-9128
Tulsa 1, Oklahoma

HELP WANTED

YOUNG MAN NEEDED to take responsible charge of fundamental and applied research in petroleum engineering Applicant should have some practical experience as well as Ph.D degree in petroleum or chemical engineering or in physics Location major university in Southwest Reply, giving usual personnel data write Box L-499, The Oil and Gas Journal, Tulsa Oklahoma.

HELP WANTED

FOREIGN — DOMESTIC EMPLOYMENT Oil, Chemical, Industrial. Write for details without obligation. Accredited Personnel Services, P. O. Box 6006, New Orleans 14, La.

ACCOUNTANT—Excellent opportunity for young man with college degree and C.P.A. or equivalent audit experience in the oil and gas industry. With internal audit staff of large expanding company located in Kansas City, Mo. Permanent position and excellent employee benefits. Include complete resume with your application. Box L-559, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL ENGINEER WANTED—for refinery now undergoing expansion program. Engineer responsible for designing refinery equipment and structures and provide engineering assistance in the maintenance of refinery and mechanical equipment. Position requires a degree in mechanical engineering; with some experience in structural engineering; four years of refining experience, robust health, and age not over thirty-five. Location—Cody, Wyoming. Salary offered—about $650 per month. Please write to James M. Wylder, Personnel Supervisor, Husky Oil Company, P. O. Box 380, Cody, Wyoming.

PROCESS ENGINEER

Engineering graduate experienced in the process design of various types of petroleum refining process units required by a midwestern engineering and construction firm. Please submit resume and photograph indicating education, experience, and salary requirements to:

BOX L-537,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

PRODUCTION ENGINEERS
CONTINENTAL OIL COMPANY

We have openings in district offices of our domestic producing operations. Minimum of three years production experience plus BS degree required. Experience in reservoir engineering, waterflooding, down-hole corrosion, gas operations, or general field operations is acceptable. Response should include salary expected and complete resume of education and experience. Reply to Chief Engineer, Production Department.

Continental Oil Company,
P. O. Box 2197, Houston, Texas.

REFINERY ECONOMIST

Immediate opening available for graduate chemical engineer or chemist in the Economics Department of a large independent oil refining company located in Puerto Rico. Three to five years experience in refinery economics, with related experience in refinery operations scheduling and some experience in blending ship cargoes of gasoline, middle distillates and residual oils desirable.

This is not a short-term job, as is usually the case in "overseas" operations, but offers every prospect of permanency to a man who can and will produce.

Send resume of experience and salary to:

M. D. Daeschner
Industrial Relations Department
Commonwealth Oil Refining Co., Inc.
P. O. Box 1406
Ponce, Puerto Rico

HELP WANTED

MANUFACTURER needs qualified associate for National distribution of well known highly successful Chemical selling to Oil and Gas producers. Merits rigid investigation. Requires early personal interview, sales ability, adequate investment. Box L-563, The Oil and Gas Journal, Tulsa, Oklahoma.

INDEPENDENT OIL COMPANY active in primary and waterflood operations has excellent opportunity for graduate petroleum engineer with 3 to 5 years production experience, preferably Oklahoma-Kansas area. Successful applicant will live in Tulsa. Send complete resume of experience and education. Replies held confidential. Box L-560, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL or MECHANICAL Engineer, Eastern U. S. Manufacturer requires experienced Engineer for Process and Mechanical Design of Fired Heaters. Age 30-40. Minimum Experience—5 years. Ch. E. or M.E. degree preferred. All replies to: Box L-540, The Oil and Gas Journal, Tulsa, Oklahoma, will be treated confidentially.

FIELD SUPERINTENDENT wanted by independent oil company operating in West Texas—SE New Mexico. Must have petroleum engineering degree and minimum of 10 years direct field experience in all phases of drilling and production, as well as diversified experience in administration and general engineering operations. This is a secure and permanent position for the right man. Reply should give all details on experience, education and personal background; also salary expected, and business and personal references. Recent photo would be helpful. Box L-555, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM MARKETING EXECUTIVE

TOP PETROLEUM MARKETING POSITION OPEN IN EXPANDING INTEGRATED INTERNATIONAL OIL COMPANY

Wide knowledge of foreign crude and refined products markets required together with experience in supply/distribution matters. Headquarters New York City with considerable foreign travel required. Compensation commensurate with record and experience.

All replies held in strictest confidence.

BOX L-547,

THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

CHEMICAL, PETROLEUM OR POWER ENGINEERS

The Foxboro Company is adding to its group of staff sales engineers to keep pace with its steadily increasing share of the industrial instrumentation industry market. Men needed should be graduate engineers with several years of instrumentation or process control experience in the chemical, petroleum, gas or power industries. You must be sales minded and should enjoy working with our customers and sales personnel. If you feel qualified for one of these challenging career opportunities send a letter and resume to:

Engineering Recruitment Office

FOXBORO

The Foxboro Company,

Foxboro, Mass.

HELP WANTED

NEW OIL JOB Directory, foreign and domestic, showing where to apply for jobs. 500 selected producing, refining, butane and pipeline companies. Nationwide $6.00 cash OILCO., Box 2603, Tulsa, Okla.

AGGRESSIVE independent wire-line service company needs experienced salesman—Oklahoma City and surrounding area. Salary commensurate with experience and ability to produce. Box L-489, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING MUD Engineer under 32 with Petroleum Engineering background. Prefer Louisiana Gulf Coast experience. Send resume' including small photo, and transcript of credits to Personnel Department, P. O. Box 1262, Dallas, Texas.

SALESMAN WANTED—Reliable party, familiar with "Oil field activity", for promotion of drilling deals, leases, etc., interested in becoming "a part of" a new Oil & Drilling Corp. Salary plus commission. Box L-566, The Oil and Gas Journal, Tulsa, Okla.

MAINTENANCE EXPERT WANTED for Paris. If you are highly qualified and have outstanding background and experience to organize and direct. Refinery maintenance organization in Europe, with headquarters in Paris, please wire or write. Retired maintenance Manager of large oil Company or other top maintenance engineer, interested to work in Europe invited to apply, stating age, experience and all details in first letter. Box L-562, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATION WANTED

ATTORNEY—Experienced foreign operations, fluent Italian, Spanish, French, Desires position abroad or stateside with growing oil company. Box L-564, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER (BS), also (BA) Geology. 41, family. Nine years diversified experience in drilling, completion, workovers, production and some reservoir. D. W. Swanson, 711 Oak Street, Red Oak, Iowa.

GEOLOGIST, ENGINEER, geophysicist. Thirty years experience all producing parts U. S. generally, Canada, Latin America, all phases production and exploration management. Speak spanish. Good health no bad habits. Go anywhere. Prefer small company. Nominal salary and expense or expenses and interest, Box L-565, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, 23 years experience in U. S., England and Canada, desires position, domestic or foreign, with Oil Company as Operational Supervisor or Interpreter. Presently employed in Canada. Box L-554, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION FOREMAN, practical engineer, 35, 14 years diversified experience, 11 years with major, dynamic worker, excellent references, family, presently employed. Box L-550, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—Eleven years experience in Mississippi and surrounding areas. Wish to become affiliated with independent or company interested in entering Mississippi. Have complete knowledge and information concerning the area, including subsurface maps, geophysics and core drill. Box L-551, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES/ENGINEERING Executive. BSChE with broad experience in petroleum and petrochemical engineering and contract sales. Seeking new, challenging executive position in engineering, sales or market development. Presently employed. Will relocate in U. S. or foreign country. Resume and references on request. Box L-548, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING SUPT. 25 years plus experience. Drilling-Workover-Fishing. 12 years in South America. Desires position with Independent Operator or Oilfield equipment sales. References: Box L-542, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION DRILLING CONTRACTORS INDEPENDENT OPERATORS

Administrative Assistant grounded in Accounting, Rig Costs, Rig Performance, Drilling Curves, Bidding, Footage and Daywork Billings, Production Records, Partner Operations, Drilling and Operating Contracts, Office Management, and related functions. Box L-558, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATION WANTED

PETROLEUM GEOLOGIST, 42, married, 16 years experience subsurface, exploration and exploitation, both administrative and operations, 5 years foreign. Capable setting up exploration and development programs. Interested either domestic or foreign employment. Box L-556, The Oil and Gas Journal, Tulsa, Oklahoma.

FINANCIAL SERVICE

HOW WHERE, $1,000.00 grew $30,000,000.00! Future? Better! Proofs? Write, Box L-561, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION FOR SALE

NEED CAPITAL. Must sell immediately two new oil wells Taylor County, Ky. Current total daily production 150 bbls. increasing daily with 250 bbls. daily production expected within 60 days. Prefer to retain ¼th working interest in each well but would sell both wells outright for $95,000. These are fine equipped wells on one of Kentuckys most prolific leases. Oil nets $2.60. Closest inspection invited. Have plane and pilot. Can fly prospective purchaser to check this offer, wells and lease. Phone FR 6-1991 or MO 4-3663 nights; or write John Miller, 1611 Main St., Little Rock, Ark.

PRODUCTION WANTED

—WANTED—
SHUT IN GAS PRODUCTION

We own compressor-liquids extraction plant and several miles gather or delivering pipe. Want shut in gas production where this plant can be operated for liquid extraction. Gas delivery to consumer or pipe line or repressuring. East of Mississippi preferred.

Gerald T. Shipman, Short Hills, N. J.
DRexel 6-2215

BUSINESS SERVICE

PETROLEUM ENGINEER: U. S. citizen living in Europe with heavy experience in crude oil production, production maintenance, well workovers, secondary recovery, etc., wishes to make contact with oil field equipment manufacturers or others who occasionally need the services of a fully qualified field engineer in Europe or North Africa. Please address reply to: Box L-568, The Oil and Gas Journal, Tulsa, Oklahoma, U. S. A.

BUSINESS OPPORTUNITIES

WANTED: Parties interested in oil and gas development in southeastern New Mexico. Write Gas and Oil Development, Box 7483, Dallas, Texas.

FINANCIAL CONTACTS, Underwriters, Private Brokers reached. No shopping. Confidential. Send details to Consultant, 817, 51st Street, Brooklyn, N. Y.

PIPE YARD for Sale, due to death of M. J. Regan, owner. Operated for 25 years on railway and main highway. Equipment includes inventory, cleaning and straightening machines and Landis threading machine, etc. Inquire: M. J. Regan Pipe Co., Phone 3892, Coffeyville, Kansas.

REAL ESTATE

If You Are Moving To CALGARY
Don't fail to visit
Rideau Towers Apartments

1—4½ rooms, furnished and unfurnished luxury apartments, $100 to $230, most distinguished address, superb hilltop view of the Rockies, 5 minutes from downtown, leases with Oil Companies invited, also sale on cooperative basis.

We cater to—
American Petroleum executives
Write or wire:
Rideau Towers Management Ltd.,
Calgary, Alberta

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware

ROYALTIES

HIGHEST PRICE PAID for oil and gas income royalties, overrides, oil properties. A. S. Berry, 109 Midco Bldg., 302 South Cheyenne, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

300 ACRES OIL LEASES—overland county—Tennessee—cheap or cooperate for shallow drilling. Ralph Mathias, Eldorado, Illinois.

40 ACRE LEASE
Okmulgee, Okla. Has 2000' oil well. Needs recond. Good potential from 3 sands. Box 707, Pacific Palisades, Calif. GL 4-4031, EX 5-0256.

I WILL LOCATE and lease your shallow drilling blocks, and will also locate production for sale in Central Kentucky—Box 135, Horse Cave, Kentucky, Phone at night, STate 6-6314.

WILL PAY CASH for production; working interest or royalty in Northeastern Oklahoma or Southeastern Kansas. Box L-567, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Oil, gas and Mineral rights, 2900 acres in Brokenstraw and Deerfield Townships, Warren County, Pennsylvania. Deep test now being made two miles south of this acreage. Write P. O. Box 255, Rouseville, Pa.

MUHLENBERG COUNTY, Kentucky. One well 8 bbl. daily and 55-acre lease. Four pays in field. Production on three sides. For sale all or part. Phone MI 5-6437—Clarksville, Tenn., Forest Ratchford.

OIL AND GAS MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2000 acres. Write quickly to: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

WATER FLOOD Franklin County, Kansas. 640 acres, good engineering and best equipment, modern in every respect. Wonderful potential, good reason for selling. No brokers. Unless you are financially responsible do not reply. Box L-326, The Oil and Gas Journal, Tulsa, Oklahoma.

Drilling Blocks in Grayson County Ky. On Rough River Fault a part of Illinois Basin. See me if you want to drill, promote or buy acreage. Frank H. Patterson Phone 4-1738 (Mrs. Mu 3-7433) 424 Locust St. Owensboro Kentucky.

LIGHT CRUDE OR CONDENSATE. Interested in contracting for 12,000 plus barrels per month API 50° or 68°, F.O.B. field into our transports. Small volume, scattered production acceptable. Within 250 mile radius Fort Worth necessary. All replies held in strict confidence. Box L-543, The Oil and Gas Journal, Tulsa. Oklahoma.

Would like to purchase entire producing oil properties in Texas, Oklahoma, Kansas, Illinois, or Indiana. No fractional interests.

Box L-538,
The Oil and Gas Journal,
Tulsa, Oklahoma.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington, D. C. Notice is hereby given that approximately 1,441 acres of land in four parcels within the Fort Sill Military Reservation, Oklahoma, on the known geologic structure of the Fort-Sill-Elgin field, will be offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 1:00 P.M., E.S.T. on December 2, 1959, when bids will be opened. Details of the lease offering, how and where to submit bids, may be obtained from the Geological Survey's Branch of Oil and Gas Leasing, General Services Administration Building, Washington 25, D. C., or Regional Oil and Gas Supervisor, Midcontinent Region, P. O. Box 311, Tulsa 1, Oklahoma, and from the Bureau of Land Management's Minerals Staff Office. Interior Building, Washington 25, D. C., or Land Office, P. O. Box 1251, Santa Fe, New Mexico, Edward Woozley, Director.

ADVERTISERS
in this issue

A

ACF Industries, Incorporated, W-K-M Division 39
Airaterra 113
Air Preheater Corporation, The 23

B

Baird Manufacturing Company 131
Baker Filtration Company 105
Baker Oil Tools, Inc. 44
Bechtel Corporation 26
Bethlehem Steel Company 122
British Petroleum Company Limited, The 111
Broderick & Bascom Rope Co. Back Cover

C

Cable & Stephens 135
California Research Corporation, a Standard Oil Company of California Subsidiary 27
Cameron Iron Works, Inc. 93
Caterpillar Tractor Co. 37
C-B Southern Inc. 35
Century Electric Company 18
Chrysler Corporation—Dodge Division 42, 43
Classified Advertising 147, 148, 149, 150
Colorado Fuel and Iron Corp., Wickwire Spencer Steel Division 25
Continental-Emsco Company, a Division of the Youngstown Sheet and Tube Company 6

D

Darling Valve and Mfg. Co. 17
Deere, John—Industrial Division 15
Dowell 1, 119
Dresser Manufacturing Division 102
Drilling Equipment Manufacturing Co. 98
du Pont 3
Duriron Company, Inc., The 5

E

Edward Valves, Inc. 34
Electric Machinery Mfg. Company .. 22
Esso Research and Engineering Company 64

F

First National Bank & Trust Co. of Tulsa 133
Ford Motor Company 103

G

Gaso Pump & Burner Mfg. Co. 11
Grinnell Company, Inc. 32, 33
Guiberson Corporation 31

H

Halliburton Oil Well Cementing Co. 12, 13, 57
Harrisburg Steel Co. 118
Holl Company, The 38

I

International Business Machines Corporation 141
International Harvester Co. 28, 29

J

Jefferson Chemical Company, Inc. ... 14

L

Link-Belt Company 7
Lone Star Steel Company 96, 97

M

Marsh Instrument Co. 24
McDonough Marine Service 135
Mission Mfg. Company Inside Back Cover
Mixing Equipment Co., Inc. 20
Motorola Communication & Electronics, Inc. 8

N

National Tank Company 152
Nelson Electric Mfg. Co. 36
Nordstrom Valve Division, Rockwell Manufacturing Company 109
Norris, Manufacturer, Inc., W. C. ... 2
Northeast Petroleum Investment Company 135

O

Oil Well Supply Division 4
Orbit Valve Company 106
Otis Engineering Corporation ... 116, 117

P

Paris Distributor, Inc., Henry H. 110
Petroleum Electric Power Association 16
Pontex Pipe Corporation 101

R

Ross-Martin Company 135

S

Smith Tool Co. 120
Socony Mobil Oil Company 114
Square D Company 10
Standard Magnesium Corporation ... 100
Standard Oil Company of California . 27
Stauffer Chemical Company 9

T

Tennessee Corporation 132
Texsteam Corporation 108

U

Union Switch & Signal Division of Westinghouse Air Brake Company .. 21
United States Rubber Company 112
United States Steel Corporation—Oil Well Supply Division 4
Universal Oil Products Company 19

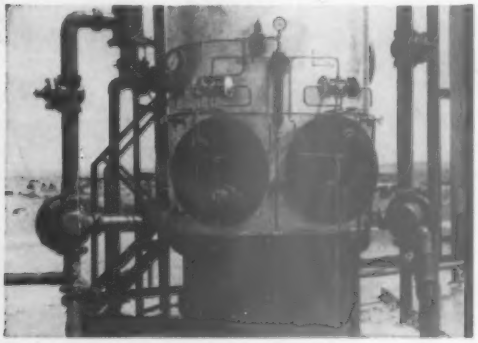
V

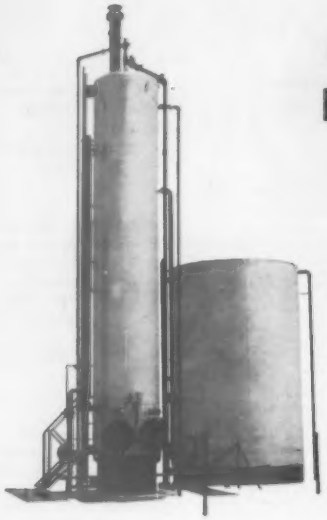
Viking Pump Company 134

W

Welex, Inc. 40
Wickwire Spencer Steel Division—Colorado Fuel and Iron Corp. 25
Wiley & Sons, Inc., John 118
W-K-M Division of ACF Industries Incorporated 39
Wyatt Metal & Boiler Works, Inc. ..... Inside Front Cover

NATIONAL'S *metering treater*





COMBINES EFFICIENT EMULSION TREATING WITH AUTOMATIC METERING AND RECORDING

Now! . . . the incomparable National emulsion treater is equipped with metering compartments to automatically meter and record the volume of water and oil being produced. Combining the metering vessels for both oil and water into a lower compartment of a National treater offers distinct advantages over adding metering vessels to the lease equipment at some other time.

NATIONAL'S METERING TREATER —

- Provides more uniform temperature of metered liquid during periods of wide variation in ambient temperature.
- Lessens paraffin deposition on wall of metering chamber by virtue of higher average temperature of oil.
- Provides measurement of clean oil and oil-free water.
- Reduces amount of solution gas in oil and thus reduces shrinkage due to flashing of oil to storage pressure.
- With "Full Area" construction of meter chambers, provides uniform fill and discharge rates over a complete cycle.
- Groups controls and working parts of metering chambers for easy accessibility or housing.
- Reduces installation time and fittings required for connecting components.
- Reduces size of foundation requirements or platform space.
- Reduces maintenance costs over multiple vessel installation.
- Allows accurate testing of wells individually without additional tank capacity.

Patent Applied for

It's a National ®

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

GET THE MOST

THE MISSION VALVE THINKS FOR ITSELF
TO SEAL AUTOMATICALLY

Not only is the Mission Valve always ready to seal, but the higher the pressure the tighter the seal. Line pressure forces Mission sealant through two semi-circular grooves around the downstream port, sealing like a plastic packing, to form a gas tight seal. Leaks are stopped *automatically* before they start. **The complete line** of 315 Mission Valves brings the positive advantages of easy opening and tight sealing to practically all valve applications. This wide selection, the Mission Guarantee, and the Mission Renewal Policy combine to make Mission Valves your best buy. Specify Mission and eliminate your valve problems.

MISSION
VALVE AND PUMP CO.

MISSION VALVE AND PUMP CO. *a subsidiary of* MISSION MANUFACTURING CO.
P. O. Box 4209, Houston, Texas cable address "MISSCO" · *export office: 30 Rockefeller Plaza, New York*

"POWERSTEEL" + TAILORED CUT-OFF PLAN RECORD:

11.09 Ton-miles per foot of rope!

This exceptionally good record on the Dale Mount Drilling Co. Rig No. 101 is due to: (1) Yellow Strand "POWERSTEEL" with its great strength and resistance to abrasion; (2) good drilling procedures, including use of a Tailored Cut-off Plan.

A 3500-foot reel of 1⅛" 6x21 "POWERSTEEL" Rotary Drilling Line is used on the rig. One reel completed 7½ wells and drilled 59,131 feet, making 321 round trips. "POWERSTEEL" served a total of 38,846 ton-miles, averaging 11.09 ton-miles per foot!

Part owner R. D. Jocoy of Dallas, Texas, developed a good rotary line service program, and follows it religiously. His standard cut-off procedure coupled with a continuous pattern of "slip-slip-cut," spreads the approximate 900 ton-miles of wear between each cut evenly throughout the line. Yellow Strand "POWERSTEEL" and a Tailored Cut-off Plan pair up for 11.09 ton-miles per foot of rope in a tough drilling area!

Your Broderick & Bascom Representative will gladly prepare a Tailored Cut-off Plan for *your* rig. He can help you determine the required footage of rotary line in the string-up – the critical line wear areas at your crown and traveling block sheaves – and how these wear areas progress through the system on successive cuts. Call him today for complete details. Broderick & Bascom Rope Co., 4203 Union Blvd., St. Louis 15, Missouri.

Yellow Strand®

WIRE ROPE SLINGS CLIPS